US005846008A

United States Patent [19]

Park

[11] Patent Number: 5,846,008

[45] Date of Patent: Dec. 8, 1998

[54] **SHEET ALIGNMENT DEVICE FOR USE IN A PRINTING APPARATUS**

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[21] Appl. No.: **756,309**

[22] Filed: **Nov. 25, 1996**

[30] **Foreign Application Priority Data**

Nov. 24, 1995 [KR] Rep. of Korea 95-35418

[51] **Int. Cl.**[6] **B41J 13/02**

[52] **U.S. Cl.** **400/634**; 400/636

[58] **Field of Search** 400/634, 636, 400/645

[56] **References Cited**

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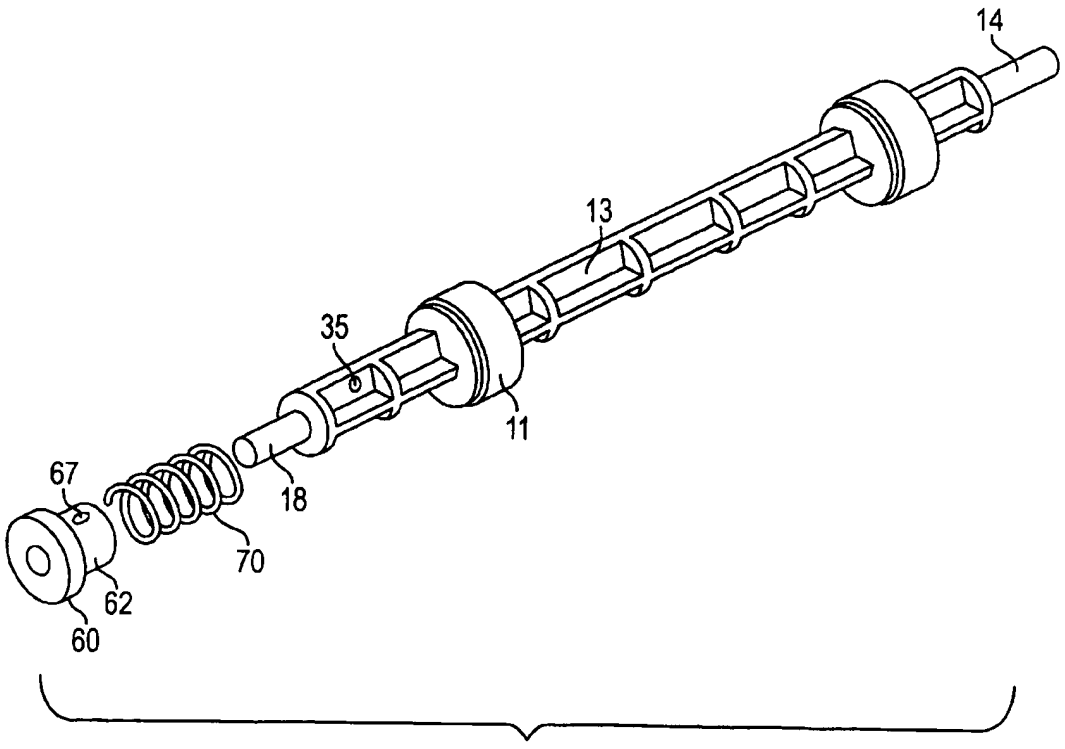
[57] **ABSTRACT**

A sheet alignment device for lining up a sheet being fed to a proper location for printing operation is disclosed. A driving gear is fittingly inserted and mounted on an axial end portion of a pivot on which at least a pair of feeding rollers are integrally formed. A torsion coil knock-up spring is used to link the pivot and the driving gear. When operated, the torsion coil knock-up spring reserves and accumulates torsion moment of the pivot. Upon cease of rotational motion of driving gear, the accumulates torsion moment forces the pivot to continue rotation thereof, allowing a sheet to advance more thereby securing printing operation from failure.

4 Claims, 2 Drawing Sheets



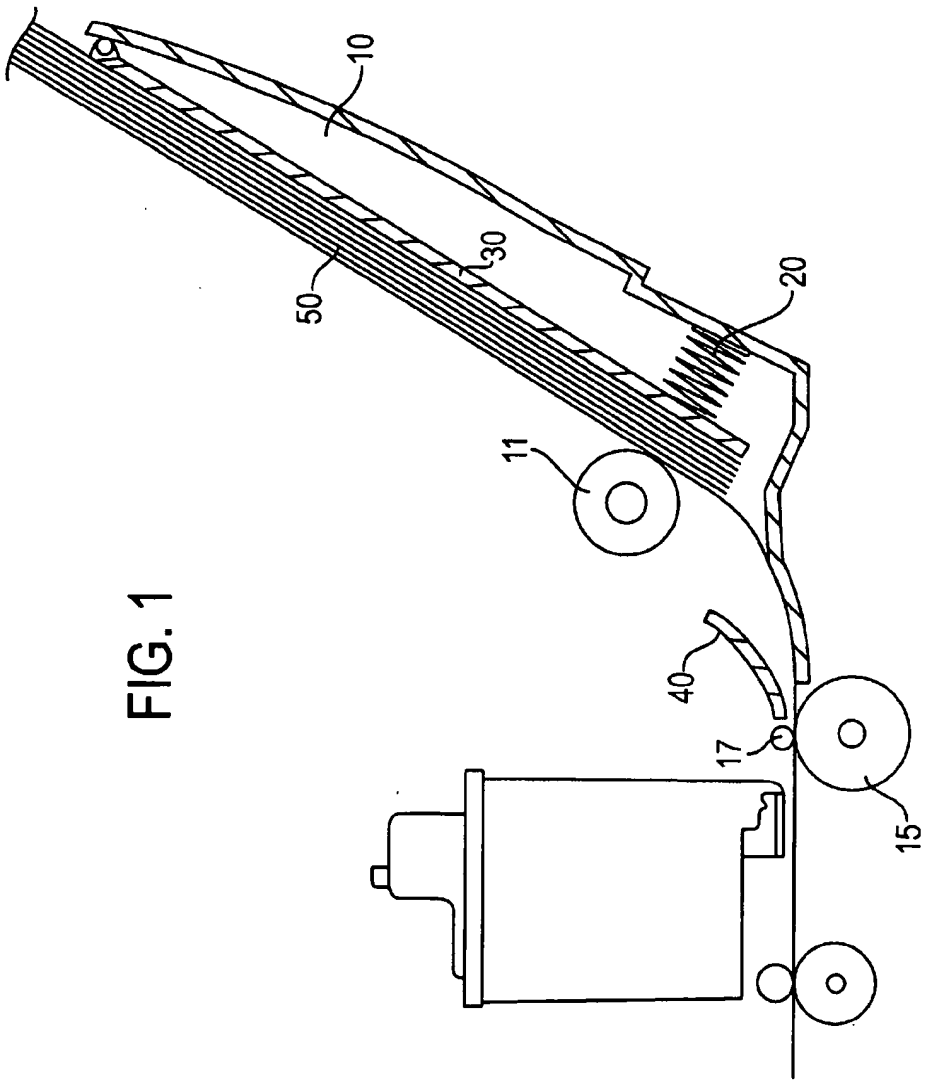


FIG. 1

FIG. 2

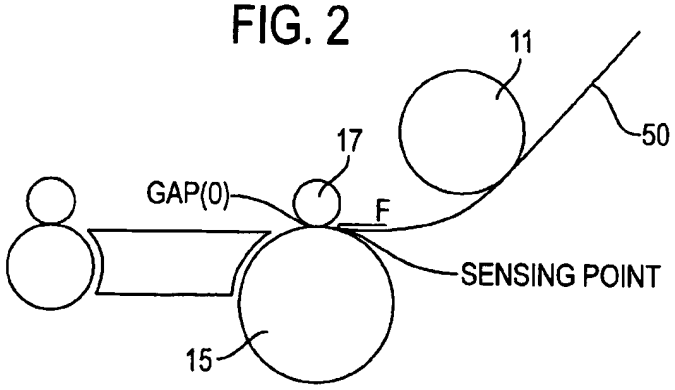
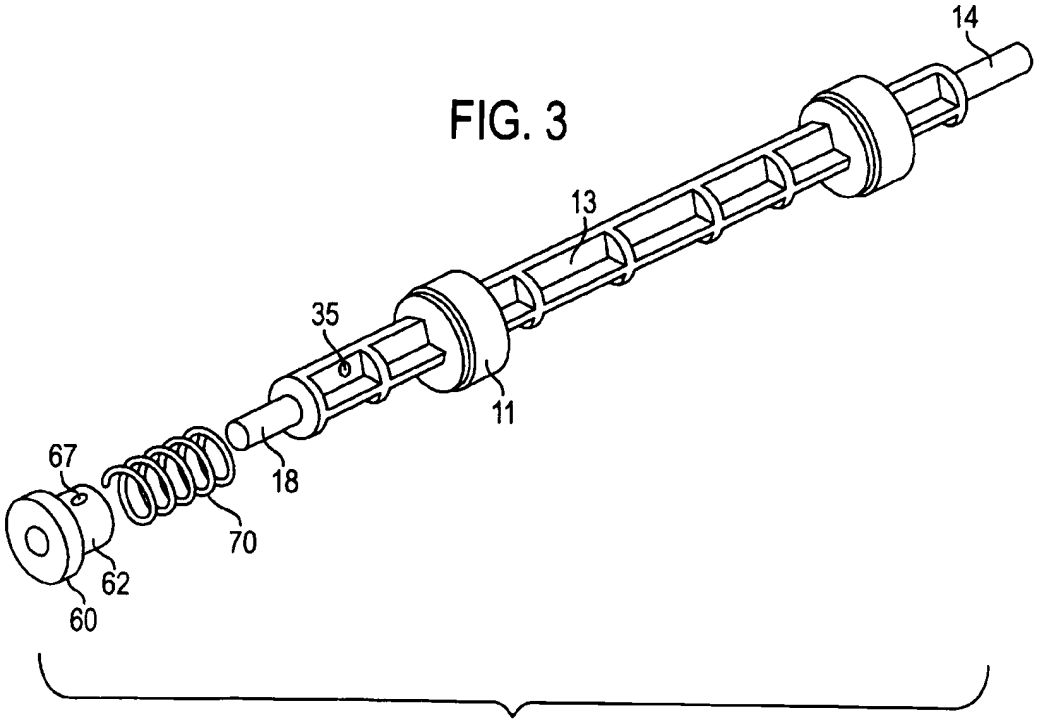


FIG. 3



SHEET ALIGNMENT DEVICE FOR USE IN A PRINTING APPARATUS

BACKGROUND OF THE INVENTION

The present invention relates to a device for aligning sheets, and more particularly, to an aligning device for lining up sheets that are fed by turns to a printing apparatus such as an ink jet printer, which is capable of disposing an edge portion of a sheet at a proper location for a printing operation regardless of the properties of a sheet such as thickness and elasticity.

Contemporary sheet feeding system as is well known in the art of printing apparatus such as a printer or a plain paper facsimile machine typically includes a paper tray, as shown in FIG. 1. In the above mentioned system, a pick-up roller **11** is installed at substantially front portion of paper tray **10**. A knock-up plate **30** mounted in a tray **10** is forced to push up a bunch of papers in the direction of the longitudinal axis of pick-up roller **11** by knock-up spring force thereby securing close adhesion of the top place sheet to pick-up roller **11**. A guide **40** disposed to guide a sheet is installed adjacent the edge portion of front end of tray **10**. Both rollers for delivering and securing papers, main roller **15** and friction roller **17**, are provided at the middle path for delivering a sheet being guided by guider **40** in the forward direction.

In operation of sheet feeding apparatus of such above construction, the top place sheet mounted in a tray **10** is fed to the sensing point adjacent a contact gap between friction roller **17** and main roller **15** by virtue of frictional force with the surface of pick-up roller **11** when the roller becomes to rotate. Thereafter main roller **15** is driven so as to deliver a sheet being fed from tray **10** to a proper location for printing. On this occasion, a sheet picked-up from tray **10** is to be delivered and advanced in the direction of level crossing with respect to a carriage (print head) movement.

To secure alignment of sheets being delivered for proper printing operation conventional practice employees such a configuration as illustrated in FIG. **2**. In the above configuration, main roller **15** is provided at a location parallel with the path of a carriage movement plane . A friction roller **17** is disposed to almost contact with the top surface of main roller **15**. Then a delivery time is measured during which a sheet can be delivered in good distance longer than the distance between pick-up roller **11** and main roller **15** when pick-up roller **11** initiates feeding operation so that main roller **15** can be rotated in the reverse direction with respect to sheet feeding direction during the given time interval.

As a result main roller **15** that rotates in an opposite direction to sheet feeding operation hinders sheet from moving forward direction though the edge portion of the sheet is still being forced to advance by pick-up roller **11**. Thus a sheet of which edge portion being kept to contact with the sensing point adjacent a gap between main roller **15** and friction roller **17**, is bent round by a curve as much distance as transferable by rotational motion of pick-up roller **11** thereby causing the sheet to have an elasticity. As previously noted, the edge portion of a sheet is forced to securely contact with surfaces of both friction roller **17** and main roller **15**, resulting in alignment with the direction of carriage movement.

Conventionally constructed sheet feeding apparatus as described in the above paragraphs, however, possess drawbacks. Among the drawbacks, it was a problem when such papers as an OHP film or even a plain paper with substantial

thickness, both being stiffer and having resistance to bending were fed. On such occasions, those stiffer sheets are unable to bend and advance for sheet alignment upon shift of rotational motion of main roller **15**, resulting in a loss of the movement through the curve due to slippage of the sheet relative to the pick-up roller, thereby causing a failure to bridge the gap between friction roller **17** and main roller **15** and contact both rollers.

Further, a back lash phenomenon produced mechanically at the instant of shifting of power transmission generated by main roller **15**, hinders such sheets as described above from retaining a bend as much distance as equal to that produced by the above back lash. These factors as described among others prevent above mentioned sheets from retaining a minimum transfixing force (F) required for proper feeding operation, causing a failure or sheet feeding error.

Based upon observations on most contemporary sheet feeding apparatus, it is found that in case of main roller being made of relatively high coefficient of friction such as rubber material , a sheet being fed is prone to excessively bend such that the edge portion thereof being eventually caught at some portion of circumference during rotation of main roller **15** in reverse direction thereby causing sheet feeding error.

SUMMARY OF THE INVENTION

Therefore, it is an object of the present invention to provide a sheet alignment device by which the front edge portion of a sheet being fed from pick-up roller is secured to retain a tight contact with a sensing point adjacent a gap formed between friction roller and main roller, thereby preventing sheet feeding errors.

It is another object of the present invention to provide a sheet alignment device capable of delivering a sheet in the forward direction at a predetermined distance by an additional rotating force produced by a pick-up roller subsequent to the stopping of the rotating motion of a driving gear for driving the pick-up roller.

It is yet another object of the present invention to support a transfixing force at the front edge portion of a sheet being fed thereby preventing a failure from sheet feeding operation regardless of the properties of papers retained in a tray. It is still another object of the present invention to secure a timely delivery of a sheet being fed to a proper location for a printing operation thereby enhancing product efficiency.

To achieve these and other objects, a sheet alignment device for use in a sheet feeding apparatus in which a driving gear is provided at an end portion of a pivot on which a pick-up roller is integrally formed. A knock-up spring coupler is used to link the driving gear and the pivot which spring coupler is disposed to reserve the turning effect of the above driving gear. Upon ceasing of the rotational motion of a driving gear, a reserved turning effect on a torsion coil of spring coupler causes a pivot to keep rotation, applying advancing force to a sheet being fed, thereby securing the sheet to locate at a proper position for printing operation.

BRIEF DESCRIPTION OF THE DRAWINGS

A more complete appreciation of the invention, and many of the attendant advantages thereof better understood by reference to the following detailed description when considered in conjunction with the accompanying drawings in which like reference symbols indicated the same or similar components, wherein:

FIG. 1 is a schematic elevational diagram of a sheet feeding apparatus conventionally adopted in the art of auto sheet feeding practice;

FIG. 2 is a schematic diagram of a sheet feeding mechanism used in conventional printing apparatus; and

FIG. 3 is a perspective view of a sheet alignment device for use in a sheet feeding apparatus according to the principles of the present invention.

DETAILED DESCRIPTION OF THE EMBODIMENT

Turning now to the drawings , a perspective view of sheet alignment device according to an embodiment of the present invention is illustrated in FIG. 3. The exemplar illustration in FIG. 3 includes at least two pick-up roller **11** spaced apart disposed on a pivot **13**, for feeding sheets **50** to a proper location for printing in a printing apparatus . Driving gear **60** provided and installed at one portion of pivot **13** is disposed to be engaged with an end portion of a pivot **13** by spring coupler **70**. Knock-up spring coupler **70** is disposed to be installed in such a manner that the knock-up spring being wound during rotational movement of driving gear **60**.

At least a pair of feeding rollers **11** are space apartedly provided at predetermined locations on the pivot **13**. One end portion **14** of pivot **13** is substantially cylindrical shaped so as to mount a bracket thereon while another end portion **18** is of shaft shape so as to be inserted into driving gear **60**. A guide portion **62** is integrally formed on a surface of driving gear **60**. Both end arms of spring coupler **70** is disposed to be inserted respective first hole **35** provided at a predetermined location on pivot **13** and second hole **67** formed on guide portion **62**, such that firm engagement is secured between driving gear **60** and pivot **13**. The spring coupler **70** is employed to transmit power from a power source (not shown) to the pivot **13**, and store and release rotational momentum to cause pivot **13** to continue to rotate after driving gear **60** stops rotating.

Once driving gear **60** initiates to rotate by a turning effect transmitted from a power source (not shown), spring coupler **70** of which arm get caught in second hole **67** is forced to wind with respect to pivot **13**. As driving gear **60** keeps rotational motion and turns on the pivot **13**, spring coupler **70** retains more torsion moment to its maximum tolerance. Upon occasion of retention of maximum torsion moment by continued rotation, spring coupler then forces pivot **13** to turn.

Therefore, feeding rollers **11** provided at predetermined position on pivot **13** become to turn and in turn to push away a sheet in contact with the lowest surface by using friction force. As noted previously, the sheet being forced is sufficiently pulled to move forward to reach a peripheral surface of main roller **15**.

On the occasion of stop of rotational motion of driving gear **60**, torsion moment retained in spring coupler **70** still keeps pivot **13** to turn in same direction which in turn forces pick-up roller to maintain rotational movement. As a result, pick-up roller **11** is urged to re-rotate, feeding a sheet, aligning the front edge portion of the sheet in the vicinity of the contact point between friction roller and main roller, otherwise a failure may occurred due to a slip or backlash at the moment of driving gear stop.

When enough time has elapsed during which the end portion of a sheet being fed is delivered to contact a gap (O) formed between the friction roller **17** and main roller **15**, the driving gear **60** ceases rotational motion for an alignment of the sheet while the main roller **15** starts rotational movement in the reverse direction (i.e., clockwise in FIG. 2).

Accordingly, the driving gear **60** ceases rotational movement for sheet alignment while the spring coupler **70** starts to unwind its coil so as to release the torsional moment retained thereon. This torsional moment forces the pivot **13** to keep rotating even after driving gear **60** has stopped.

Thus, the pick-up roller is forced to maintain rotation allowing a sheet to move forward a predetermined distance, thereby securing tight contact between the end portion of a sheet and the gap (O). Therefore, a backlash phenomenon which occurs upon a stoppage of the driving gear **60** or a slippage phenomenon caused by the pick-up roller **11** no longer hinders sheet alignment.

Therefore, torsional moment as explained above can sufficiently offset any forces caused by backlash phenomenon and may still reinforce transfix force (F) at a substantially constant level thereby securing printing operational efficiency. Such a torsional torque as described above may be enough if the strength thereof applied to a sheet being fed gives at least a minimum transfix force (F) required for proper sheet feeding operation

However, the strength of above described a torsional torque is to be less than such a torque that may cause a frictional slip between a sheet and pick-up roller. That is, at the initial stage of pick-up and feed operation or otherwise during reverse rotation motion of main roller **15** for sheet alignment, torsion coil spring is required to reserve a sufficient quantity of torsional moment in advance to an occurrence of a slip as explain above.

As described above, according to sheet alignment configuration of one preferred embodiment of the present invention, a sheet being fed is secured to reach in the vicinity of main roller regardless of any properties of paper in a tray, preventing failure from sheet feeding operation thereby enhancing product efficiency.

Although the preferred embodiments of the invention have been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims.

What is claimed is:

1. A sheet alignment device for use in a sheet feeding apparatus to feed a sheet to a pick-up location and maintain an edge of the sheet at the pick-up location, said device comprises:

a pivot having a pick-up roller integrally formed thereon;

a driving gear disposed at one end portion of said pivot for transmitting power to directly control rotation of said pivot and said pick-up roller in a first direction to thereby feed the sheet to the location; and

a spring coupler coupling said pivot and said driving gear together such that rotation of said driving gear winds said spring coupler to store rotational energy which in turn rotates said pivot in said first direction after said driving gear has stopped to thereby maintain an edge of the sheet in the pick-up location.

2. The sheet alignment device according to claim **1**, in which said spring coupler is disposed to wind in the rotating direction of said pick-up roller.

3. The sheet alignment device according to claim **1**, in which at least a pair of said feeding rollers are spaced apart and provided integrally on said pivot.

4. A sheet alignment device for use in a sheet feeding apparatus, said device comprising:

a pick-up roller fixedly mounted on a shaft for feeding a sheet into a predetermined pick-up location;

a driver disposed at one end of said shaft for directly driving said shaft in a first rotational direction;

a spring coupler attached to said shaft and said driver such that rotation of said driver in said first direction winds said spring coupler to store rotational momentum which in turn forces said shaft and said pick-up roller to rotate in said first direction after said driver ceases rotating to continually bias and align the sheet into said pick-up location; and

a main roller disposed at said pick-up location to rotate in a second rotational direction to feed the sheet through said apparatus.

* * * * *

US005667321A

United States Patent [19]

Sago

[11] Patent Number: 5,667,321

[45] Date of Patent: Sep. 16, 1997

[54] **PAPER GUIDE APPARATUS FOR USE IN AN IMAGE FORMING APPARATUS**

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[73] Assignee: **Brother Kogyo Kabushiki Kaisha**, Nagoya, Japan

[21] Appl. No.: **633,078**

[22] Filed: **Apr. 16, 1996**

[30] **Foreign Application Priority Data**

May 9, 1995 [JP] Japan 7-110783

[51] **Int. Cl.**[6] **B41J 13/10**

[52] **U.S. Cl.** **400/642**; 400/645

[58] **Field of Search** 400/642, 645, 400/645.1, 645.4, 662, 717, 718; 226/196, 198

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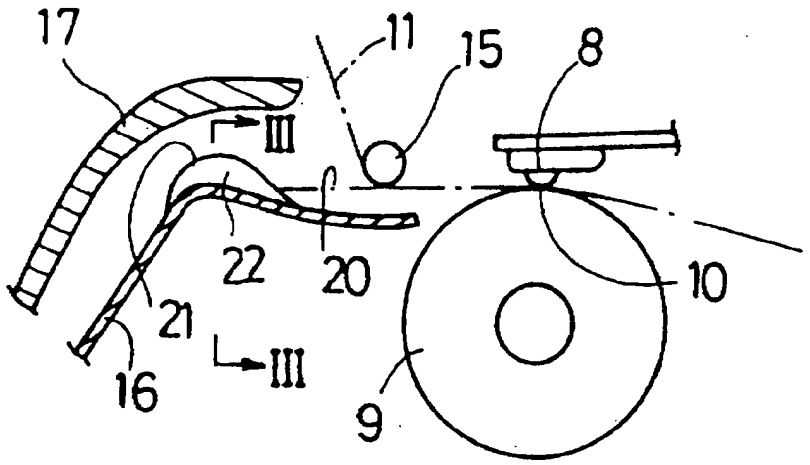
Primary Examiner—Edgar S. Burr
Assistant Examiner—Anthony H. Nguyen
Attorney, Agent, or Firm—Oliff & Berridge

[57] **ABSTRACT**

Printed paper is peeled off from an ink sheet at a rear sheet guide roller to be initially fed along a tangential line on a platen roller. When the leading edge of the paper reaches a projecting portion on one of two guide plates, the paper is forcibly bent or redirected toward the other guide plate beyond or through the tangential line, the paper being formed in a shape generally resembling the letter S along a clearance between the projecting portion and the other guide plate. The paper carried in this shape has an inherent stiffness and therefore does not generate vibration due to shaking when peeled off from the ink sheet at the rear sheet guide roller. Consequently, the paper does not beat the guide plates and generates no noise.

12 Claims, 5 Drawing Sheets



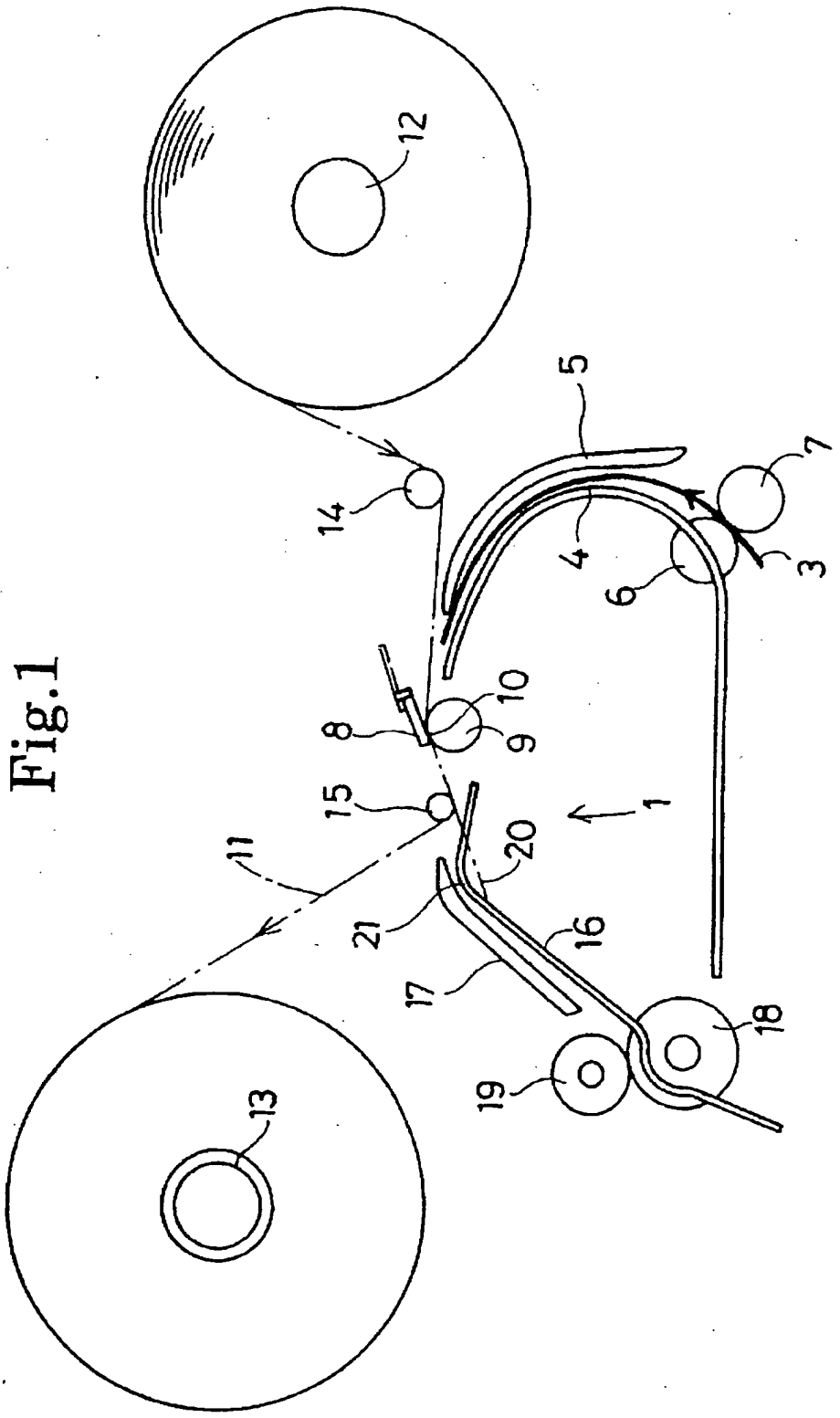


Fig.1

Fig.2

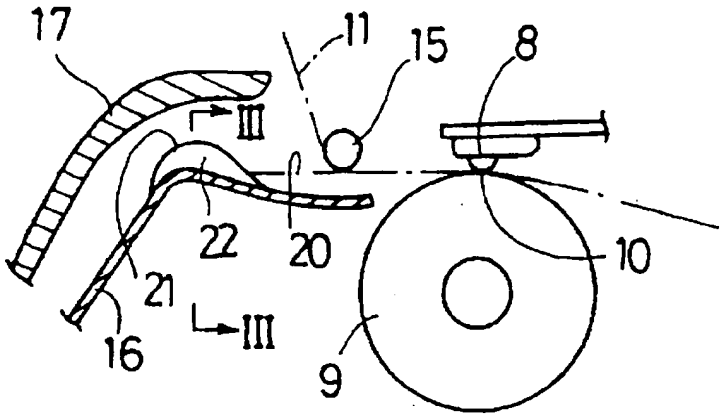


Fig.3

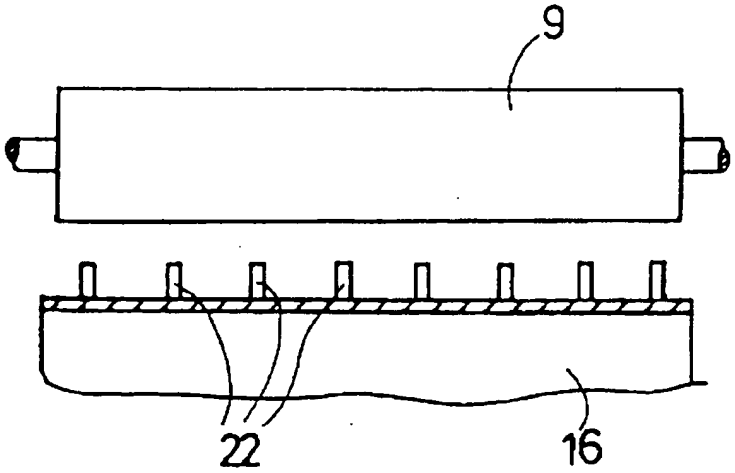


Fig.4

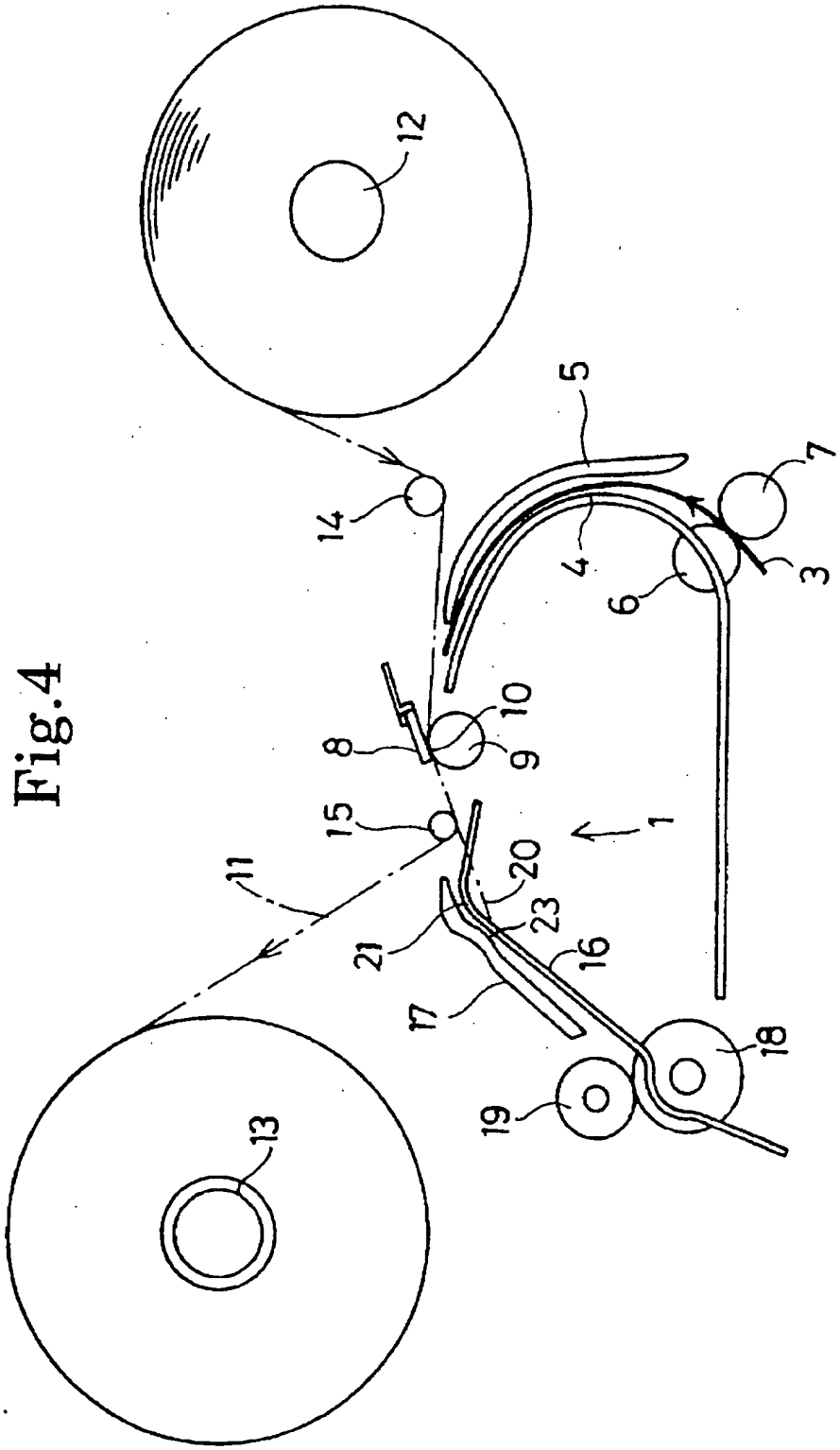


Fig.5

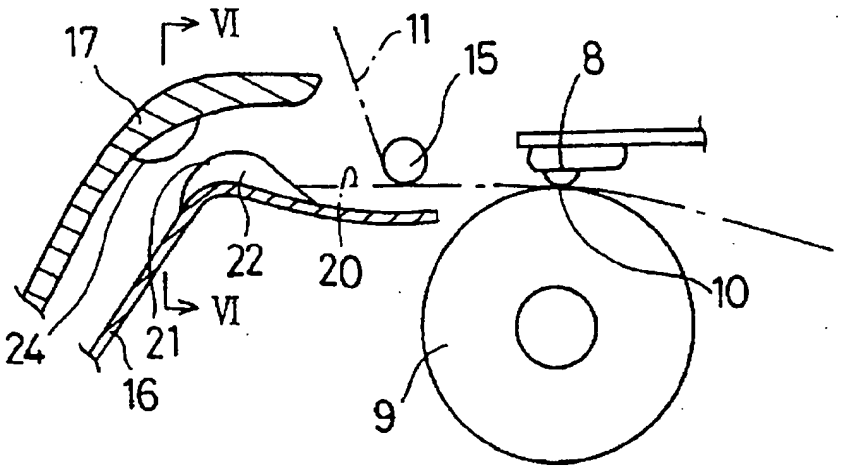
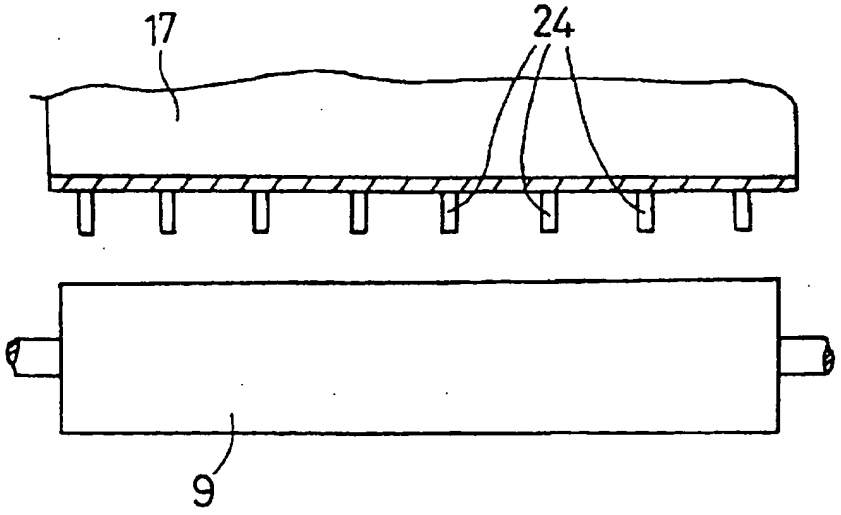


Fig.6



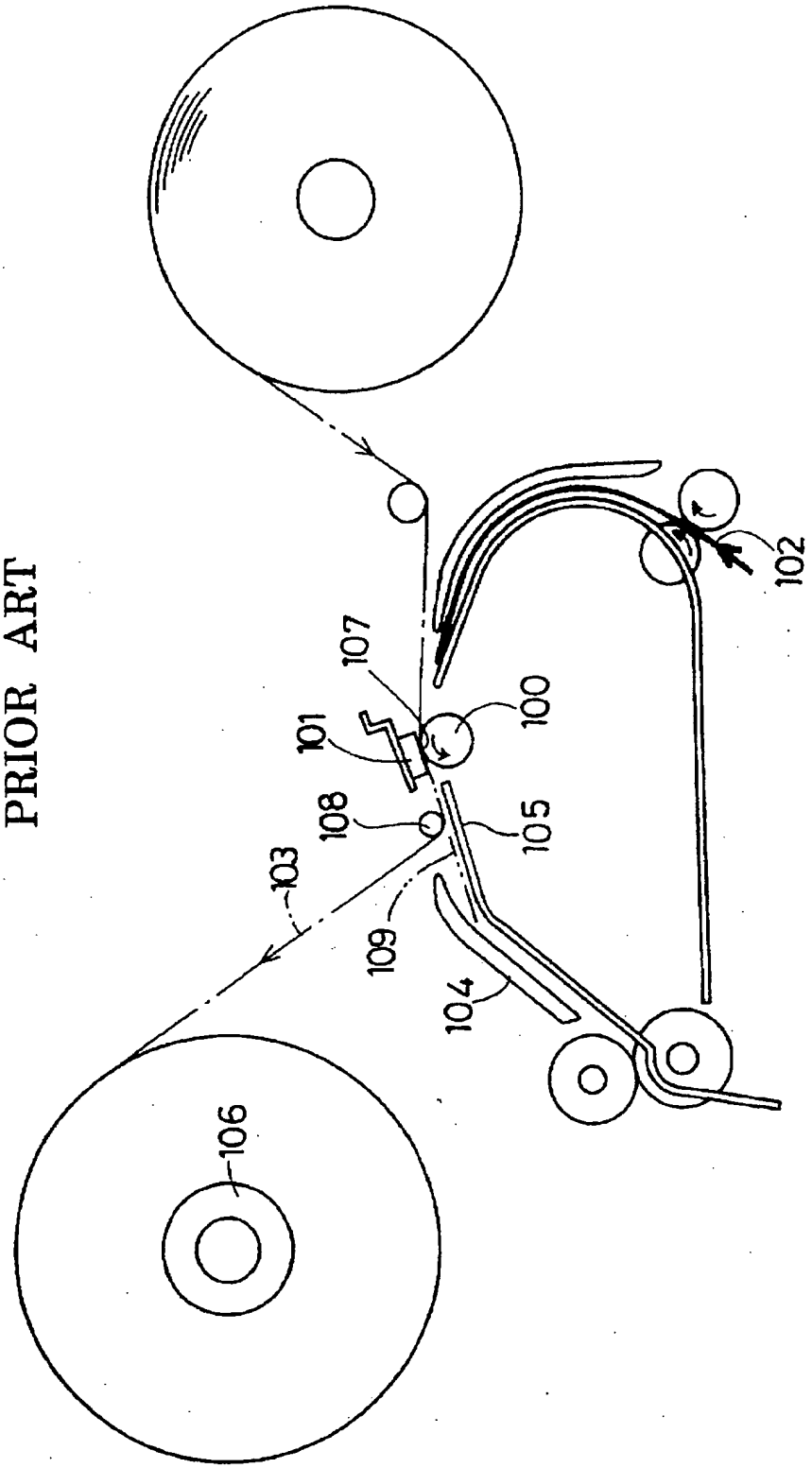


Fig.7
PRIOR ART

PAPER GUIDE APPARATUS FOR USE IN AN IMAGE FORMING APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an apparatus for guiding paper delivered from an image forming assembly of an image forming apparatus such as a copier, a printer, and a facsimile device.

2. Description of Related Art

In image forming apparatuses such as mentioned above, a printing assembly is known in which, as shown in FIG. **7**, a thermal head **101** is pressed against a rotating platen roller **100** on the circumferential surface thereof, a heat-transfer ink sheet (an ink ribbon) **103** is passed between paper (plain paper) **102** passing along the circumferential surface of the platen roller **100** and the thermal head **101**, and a voltage is applied to a resistance heating element arranged on the thermal head **101**, thereby causing the ink on the ink sheet **103** to be heat-transferred onto the surface of the paper by the heat given off from the resistance heating element.

In the above-mentioned known printing assembly, when a portion on the surface of the paper **102** to which the ink resolved from the ink sheet **103** by the heat generated by the resistance heating element is attached has moved by the rotation of the platen roller **100** from an image forming assembly **107** to the paper delivery side, the transferred ink is fused to make the ink sheet **103** adhere to the paper **102**. To peel off the ink sheet **103** from the paper **102** on the delivery side, a feed path for the ink sheet **103** is bent at a sheet guide roller **108** along which the ink sheet **103** is wound around a take-up reel **106**, while the printed paper **102** is guided between two opposing guide plates **104** and **105** to be delivered.

However, in the above-mentioned prior art construction, when the paper **102** to be delivered from the image forming assembly **107** is peeled off from the ink sheet **103** at the sheet guide roller **108**, the paper **102** is carried in the direction of delivery (between the two guide plates **104** and **105**) with the vibration caused by an uneven pattern of ink adhesion and/or an uneven adhesion of the ink to the paper **102**. This vibration causes the paper **102** to beat at least one of the guide plates **104** and **105**, which produces an undesirable noise.

Especially, the guide plate nearer the platen roller **100** (normally the guide plate **105** that opposes the paper from the underside) is arranged such that its surface is generally parallel to a line **109** tangential to the circumference of the platen roller **100**. Consequently, the paper **102** to be delivered by the rotation of the platen roller **100** is held at its leading edge by nothing until reaching the bending delivery path formed by the two guide plates **104** and **105**, so that the paper **102** shakes, inevitably beating the surface of the guide plate **105**.

SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide a paper guide apparatus for use in an image forming apparatus, the paper guide apparatus preventing, by a simple construction, the above-mentioned noise from being generated from an image forming assembly.

In carrying out the invention and according to one aspect thereof, there is provided a paper guide apparatus for use in an image forming apparatus comprising two guide plates for guiding and feeding to a downstream side of feeding paper

that passes through an image forming assembly composed of a printing assembly for printing an image to the paper and a roller abutted against the printing assembly. The two guide plates are arranged such that they oppose each other in a bent manner with the paper passing between them. One of the guide plates which is disposed at a position nearer the roller relative to its tangential line in the image forming assembly is formed on a surface thereof with a projecting portion for forcibly separating the paper approaching the surface toward the other guide plate beyond the tangential line.

Further, according to the invention, the paper guide apparatus has a plurality of projecting portions such as mentioned above arranged on the above-mentioned one of the guide plates across the width thereof at certain intervals and along the paper feed direction in a shape of longitudinal ribs.

In this novel construction as described above, when the leading edge of the printed paper reaches the projecting portions on one of the guide plates, the paper is forcibly bent beyond the above-mentioned tangential line toward the other guide plate to pass through a bent gap between the projecting portions and the other guide plate, and the paper is resultantly bent in a generally S shape. The paper being carried in the S shape has an inherent stiffness of its own, thereby preventing the paper from shaking. Consequently, the paper does not beat the surfaces of the guide plates, and generates no noise. The guide plates at certain intervals along the paper feed direction may include one or more longitudinal ribs.

In this novel construction above, the guide plate is provided with projecting portions in the form of longitudinal ribs rather than bending the entire width of the guide plate, and the projecting portions may be shaped differently along the width of the guide plate.

BRIEF DESCRIPTION OF THE DRAWINGS

Preferred embodiments of the present invention will be described in detail with reference to the following figures wherein:

FIG. **1** is a schematic side view illustrating a paper guide apparatus practiced as the first preferred embodiment of the invention;

FIG. **2** is a side view illustrating the main portion of a paper guide apparatus practiced as the second preferred embodiment of the invention;

FIG. **3** is a cross sectional view of FIG. **2** along line III—III;

FIG. **4** is a schematic side view illustrating the first modification to the paper guide apparatus according to the invention;

FIG. **5** is a schematic side view illustrating the second modification to the paper guide apparatus according to the invention;

FIG. **6** is a cross sectional view of FIG. **5** along line VI—VI; and

FIG. **7** is a schematic side view of a prior art paper guide apparatus.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

This invention will be described in further detail by way of example with reference to the accompanying drawings.

FIG. **1** shows a schematic side view illustrating main portions of a printing assembly and a paper guide apparatus **1** in a facsimile unit, the paper guide apparatus being practiced as the first preferred embodiment of the present

invention. A sheet 3 delivered from a stack of paper set on a tray of a paper supply cassette (not shown) arranged under a main frame of the facsimile unit is fed by an intermittently swiveling paper supply roller (not shown) arranged above the paper stack. One sheet at a time is delivered between two paper supply guide plates 4 and 5 that are bent as shown in FIG. 1, for example. The paper 3 is then fed by a pair of supply rollers 6 and 7 to an image forming assembly 10 between a linear thermal head 8 and a platen roller (rotary roller) 9. the image forming assembly functioning as a printing device. The image forming assembly 10 includes a supply reel 12 around which an ink sheet 11 is wound and a take-up reel 13 for taking up the ink sheet. The ink sheet 11 is fed from the supply reel 12 along a front sheet guide roller 14 through a portion at which the thermal head 8 and the platen roller 9 are abutted against each other (namely the image forming assembly 10) to a rear sheet guide reel 15 to be wound around the take-up reel 13. The paper 3 printed in the image forming assembly 10 is fed through guide plates 16 and 17 to be delivered by a pair of delivery rollers 18 and 19 into a paper receptacle (not shown).

It should be noted that the guide plates 16 and 17 are bent as shown, for example, between the rear sheet guide roller 15 and the pair of delivery rollers 18 and 19. The guide plate 16 nearer the platen roller 9 extends toward the circumferential surface of the platen roller 9. In addition, a central portion of the guide plate 16 is formed with a projecting portion 21 that projects toward the other guide plate 17 beyond a tangential line 20 defined between the thermal head 8 and the platen roller 9 in the image forming assembly 10, downstream of the paper feed direction from the rear sheet guide roller 15.

According to the above-mentioned construction, the paper 3 and the ink sheet 11 supplied from the upstream side are tightly pressed against each other in the image forming assembly 10 in which the thermal head 8 and the platen roller 9 are pressed against each other. In the image forming assembly 10, ink at predetermined pixels on the ink sheet 11 is fused by heat generated by a resistance heating element provided on the thermal head 8 to be transferred onto the paper 3 for image formation.

Then, up to the rear sheet guide roller 15, the ink sheet 11 and the paper 3 are fed together in tight contact with each other generally in parallel to or along the tangential line 20. At the rear sheet guide roller 15, the ink sheet 11 is diverted sharply away from the tangential line 20 to be wound around the take-up reel 13.

On the other hand, the paper 3 is peeled off from the ink sheet 11 at the rear sheet guide roller 15 to be carried in the direction of the tangential line 20. When the leading edge of the paper 3 reaches the projecting portion 21 on the guide plate 16, the paper 3 is forcibly redirected or bent toward the other guide plate 17 beyond the tangential line 20. The paper 3 enters a clearance between the projecting portion 21 and the guide plate 17 in a shape generally resembling a letter S. The paper 3 in this "S" shape has an inherent stiffness in at least the longitudinal direction. Consequently, when peeled off from the ink sheet 11 at the rear sheet guide roller 15, the paper 3 does not shake. This in turn prevents the surface of the paper 3 from beating the guide plate 16. As a result, no noise is generated from contact between the guide plates and the paper 3.

The second preferred embodiment is shown in FIGS. 2 and 3. The projecting portion 21 provided midway on the guide plate 16 is formed by a plurality of longitudinal ribs 22 arranged along the paper feed direction. It should be noted that the plurality of longitudinal ribs 22 are arranged on the guide plate 16 in a projected manner at appropriate intervals generally across the width of the paper 3. Because the projecting portion 21 is formed by the plurality of longitudinal ribs 22, a plurality of projecting portions 21 may be advantageously provided along the width of the flat guide plate 16, unlike providing the single projecting portion of FIG. 1 fully along the entire width of the guide plate 16.

It will be apparent to those skilled in the art that the printing assembly used in the present invention may be of electrophotographic type in which toner is attached to an electrostatic latent image on a photosensitive drum and a resultant toner image is transferred to paper to be fused by heating and pressing, instead of the above-mentioned printing assembly using a thermal head and an ink sheet (ink ribbon).

While the preferred embodiments of the present invention have been described using specific terms, such description is for illustrative purposes only, and it is to be understood that changes and variations may be made without departing from the spirit or scope of the appended claims.

For example, referring to FIG. 4, a projecting portion 23 may be provided on the guide plate 17 of FIG. 1 at a position nearer the pair of delivery rollers 18 and 19 rather than the position at which the projecting portion 21 is located on the guide plate 16 opposing the guide plate 17. In this construction, the paper 3 is peeled off from the ink sheet 11 at the rear sheet guide roller 15 and carried toward the pair of delivery rollers 18 and 19. When the leading edge of the paper 3 reaches the projection portion 23 provided on the guide plate 17, the paper 3 is forcibly bent toward the guide plate 16 to be led into a clearance between the projecting portion 23 and the guide plate 16 to be further bent into a shape generally resembling the letter S. The paper 3 bent in such a shape has an inherent stiffness of its own. Consequently, the paper 3 does not beat by the surface thereof the guide plate 17, generating no noise.

Further, referring to FIGS. 5 and 6, the projecting portion 23 provided midway on the guide plate 17 may be formed by a plurality of longitudinal ribs 24 arranged along the feed direction of the paper. The plurality of longitudinal ribs 24 are provided on the guide plate 17 along substantially the entire width of the paper 3 at appropriate intervals. According to this construction, the projecting portion 23 (FIG. 4) is formed by the plurality of longitudinal ribs 24, and a plurality of projecting portions 23 may be advantageously provided along the width of the flat guide plate 17, unlike providing the single projecting portion along the entire width of the guide plate 17 (FIG. 4).

What is claimed is:

1. A paper guide apparatus comprising:

printing means for printing paper with an ink sheet, said paper including a leading edge;

a roller abutting against said printing means;

a pair of opposed guide plates for guiding said paper downstream from said printing means and said roller;

a first surface provided on one of the pair of opposed guide plates and a second surface provided on the other one of said pair of opposed guide plates; and

a device for imparting stiffness to the paper including a projecting portion provided on the first surface to forcibly redirect said leading edge of said paper approaching said first surface through a tangential line that is tangential at a point of contact of the printing means with said roller to the second surface such that the leading edge contacts the second surface provided on the other one of said pair of opposed guide plates.

2. The paper guide apparatus as claimed in claim 1, wherein said pair of guide plates are arranged in a bent form on upper and lower sides of said paper, a surface of one of the pair of guide plates that is arranged near said roller relative to said tangential line being formed with a projecting portion for making said paper approaching said surface forcibly depart toward a surface of the other guide plate through the tangential line of said roller.

3. The paper guide apparatus as claimed in claim 2, wherein said projecting portion comprises a plurality of projections spaced along the width of said paper, each of the plurality of projecting portions comprising a longitudinal rib formed along the paper feed direction.

4. The paper guide apparatus as claimed in claim 2, further comprising a second projecting portion provided on a surface of the other of said pair of guide plates for making the paper approaching said second surface forcibly depart back toward the first surface of said one of said pair of guide plates.

5. The paper guide apparatus as claimed in claim 4, wherein said second projecting portion comprises a plurality of projections provided along the width of said paper at appropriate intervals, each of the plurality of projecting portions comprising a longitudinal rib formed along the paper feed direction.

6. A paper guide apparatus, comprising:

printing means for printing paper with an ink sheet;

a roller abutting against said printing means;

separating means for separating the printed paper from said ink sheet;

a pair of opposed guide plates for guiding said paper downstream from said printing means and said roller; and

guiding means provided on a surface of said pair of guide plates, said guiding means defining an angle of greater than zero as measured between a line along the feed direction of a leading edge of said paper approaching said surface and a straight line connecting the roller and said separating means,

wherein said guiding means comprises a pair of downstream guide plates arranged on upper and lower sides of said paper, a surface of one of the pair of guide plates that is arranged nearest said roller relative to a tangential line that is tangential at a point of contact of the printing means with said roller being formed with a device for imparting stiffness to the paper including a projecting portion for forcibly redirecting said paper approaching said surface to contact a surface of the other guide plate through the tangential line of said roller.

7. The paper guide apparatus as claimed in claim 6, further comprising take-up means for taking up said ink sheet after printing, said guiding means shifting said paper toward the ink sheet take-up means.

8. The paper guide apparatus as claimed in claim 6, wherein said guiding means is arranged along the width of said paper at appropriate intervals, said guiding means comprising a plurality of longitudinal ribs spaced along the paper feed direction.

9. The paper guide apparatus as claimed in claim 6, wherein said projecting portion includes a plurality of projections spaced along the width of said paper at appropriate intervals, each of the plurality of projecting portions comprising a longitudinal rib formed along the paper feed direction.

10. The paper guide apparatus as claimed in claim 6, wherein said guiding means comprises a second projecting portion provided on said surface of the other of said pair of guide plates for making the paper approaching said surface forcibly depart back toward the surface of said one of said pair of guide plates.

11. The paper guide apparatus as claimed in claim 10, wherein said second projecting portion comprises a plurality of projections provided along the width of said paper at appropriate intervals, each of the plurality of projecting portions comprising a longitudinal rib formed along the paper feed direction.

12. A paper guide apparatus comprising:

a printer for printing characters on a recording medium;

a roller abutting against said printer at a tangential point of contact that defines a tangential line of the roller;

a pair of opposed guide plates for initially guiding said recording medium along a first path substantially parallel to the tangential line of said roller; and

a device for imparting stiffness to the recording medium including a projecting portion provided on a first surface of at least one of said pair of guide plates to forcibly redirect said recording medium approaching said first surface along a second path that is not parallel to the first path to contact a second surface provided on the other one of said pair of opposed guide plates.

* * * * *

US005897259A

United States Patent [19]

Ahn

[11] Patent Number: 5,897,259

[45] Date of Patent: Apr. 27, 1999

[54] **PAPER FEEDING UNIT FOR APPARATUS USING PRINTER HEAD**

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[73] Assignee: **SamSung Electronics Co., Ltd.**, Suwon, Rep. of Korea

[21] Appl. No.: **08/922,306**

[22] Filed: **Sep. 2, 1997**

[30] **Foreign Application Priority Data**

Aug. 30, 1996 [KR] Rep. of Korea 96-37155

[51] **Int. Cl.**[6] **B41J 11/58**

[52] **U.S. Cl.** **400/629**; 271/109; 347/104

[58] **Field of Search** 400/629, 634, 400/636, 636.3, 637, 641, 642, 645, 645.3, 645.4; 347/104; 271/109, 113, 226

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Primary Examiner—Eugene H. Eickholt

Attorney, Agent, or Firm—Robert E. Bushnell, Esq.

[57] **ABSTRACT**

A paper feeding unit for a printing apparatus including conveyance and friction rollers conveying paper from a paper cassette to an image-transfer zone, the paper being urged against a frame, having a surface substantially parallel with the image-transferring zone, with one end of a spring mounted on the end of a cantilevered paper guide.

16 Claims, 9 Drawing Sheets

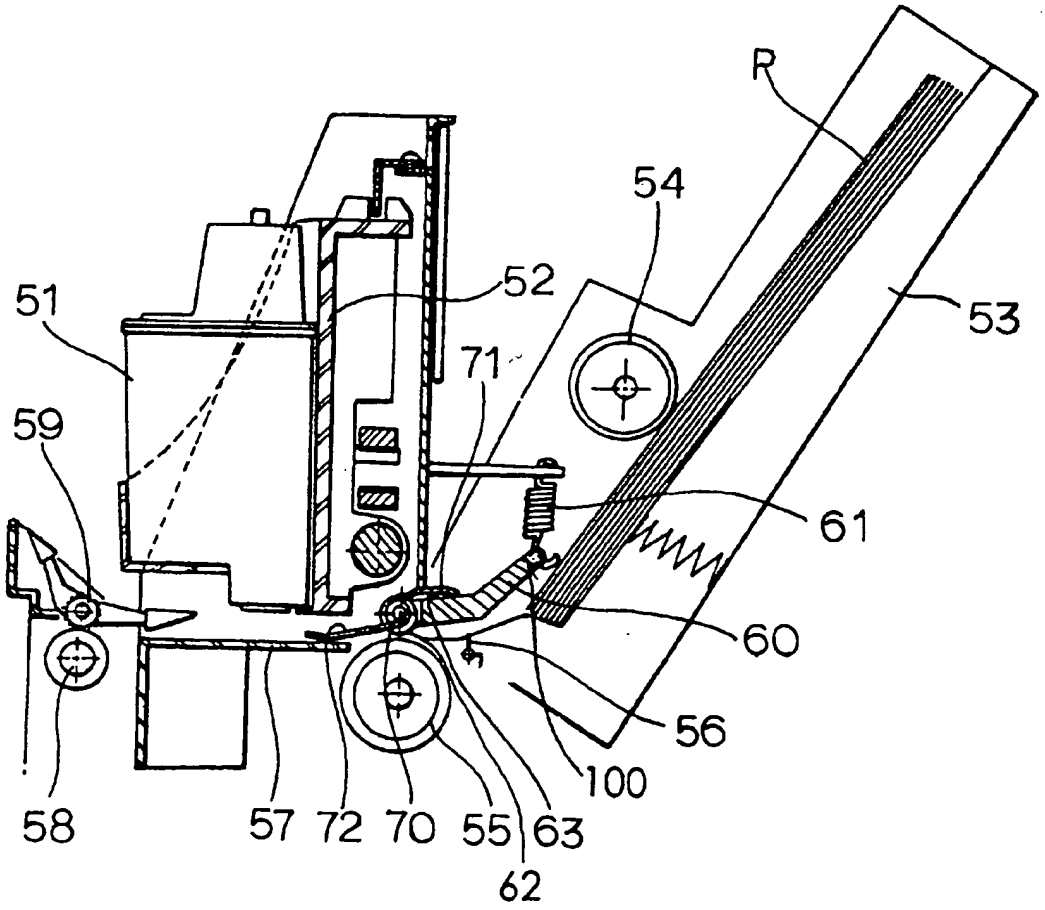


FIG. 1

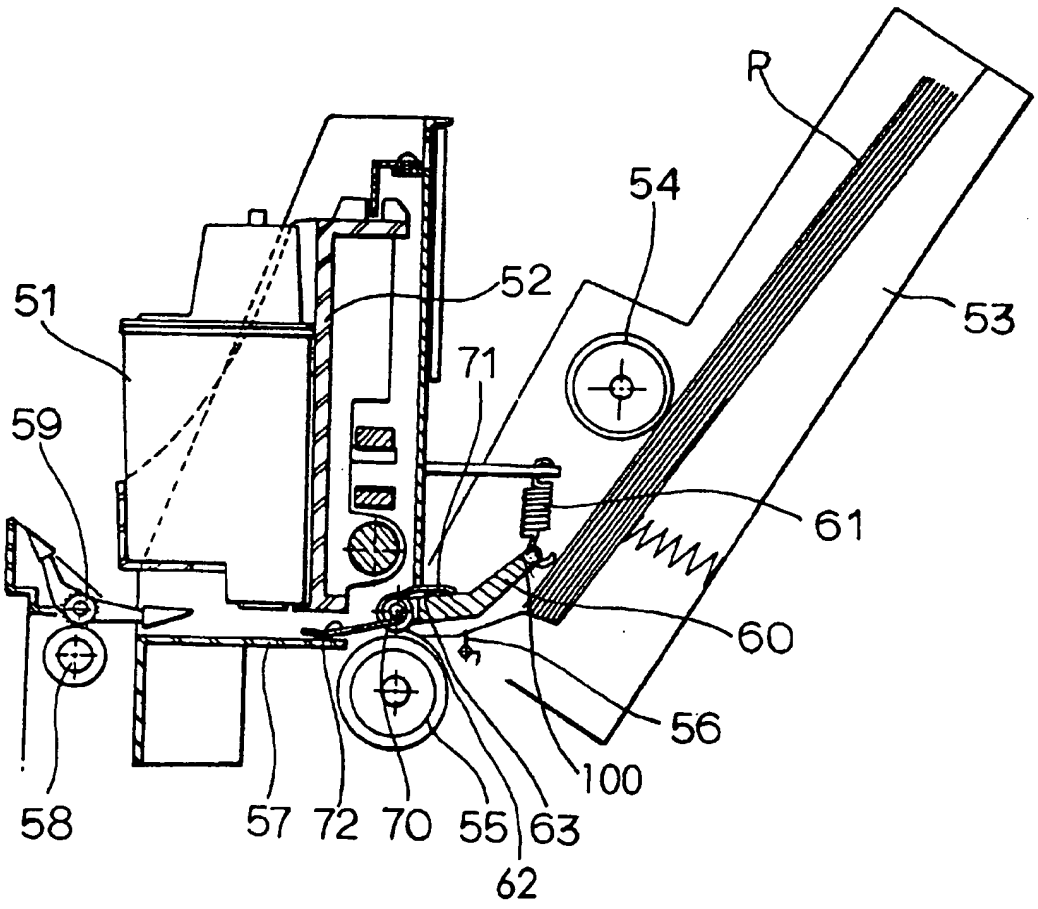


FIG. 2

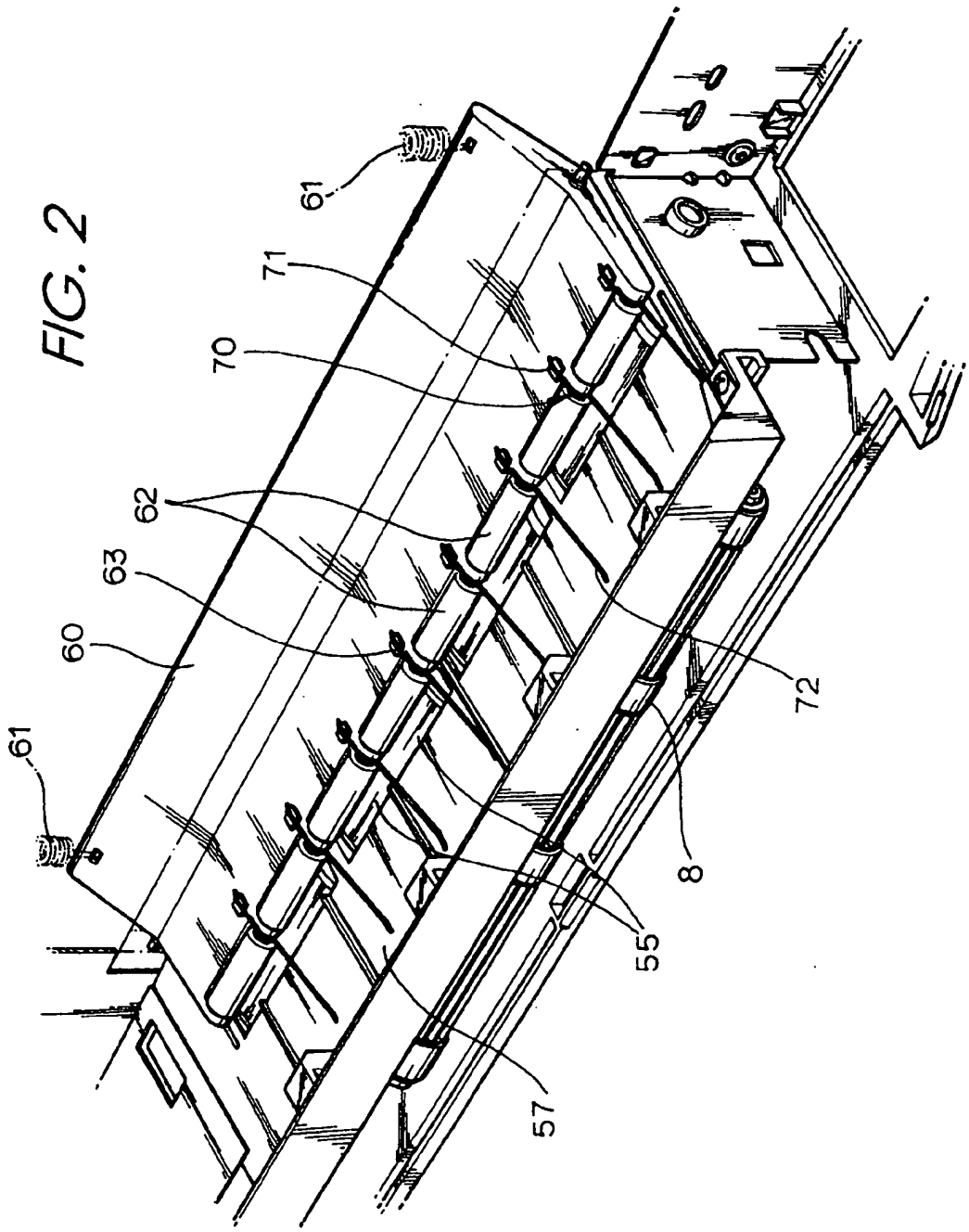


FIG. 3

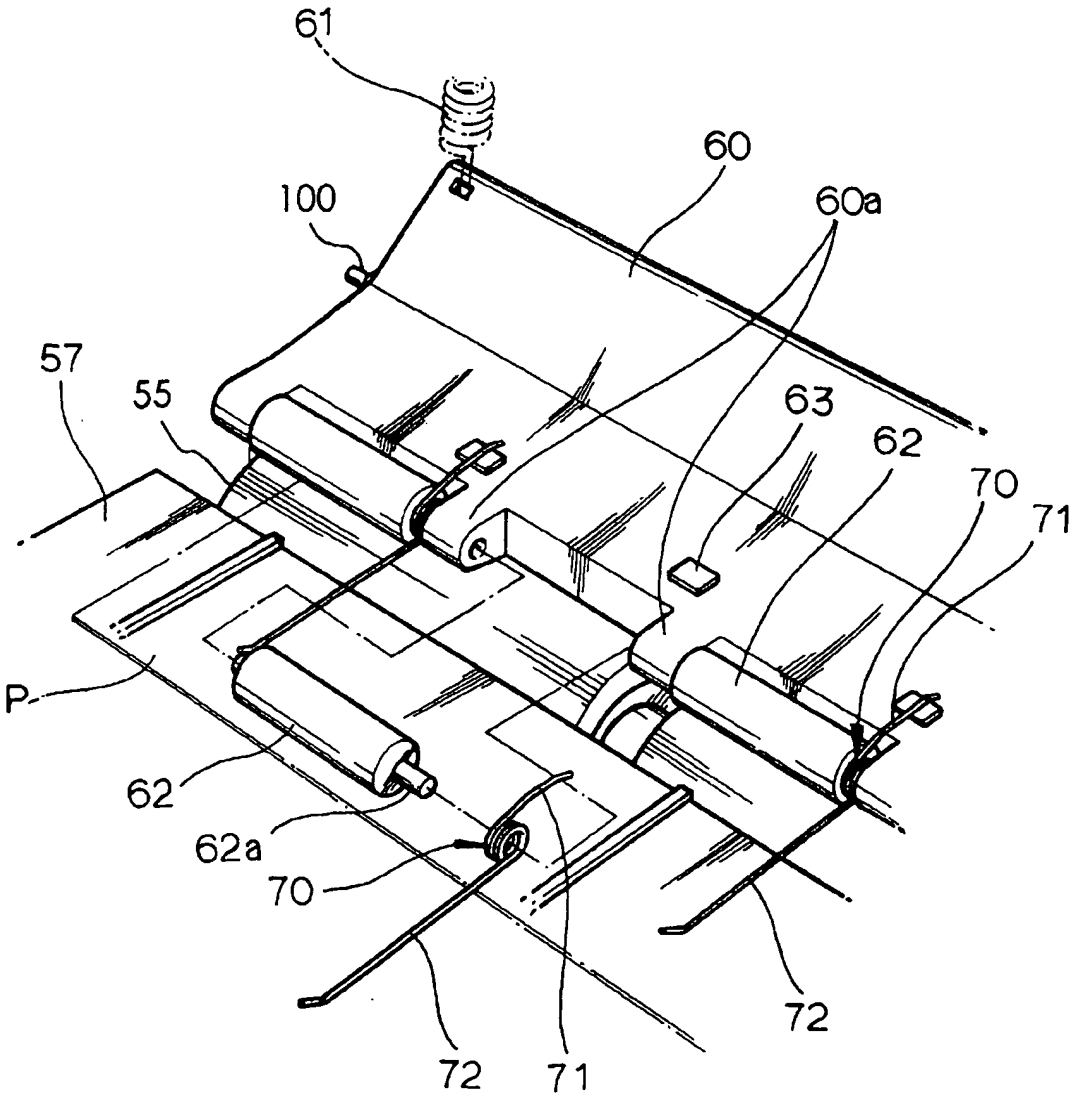


FIG. 4

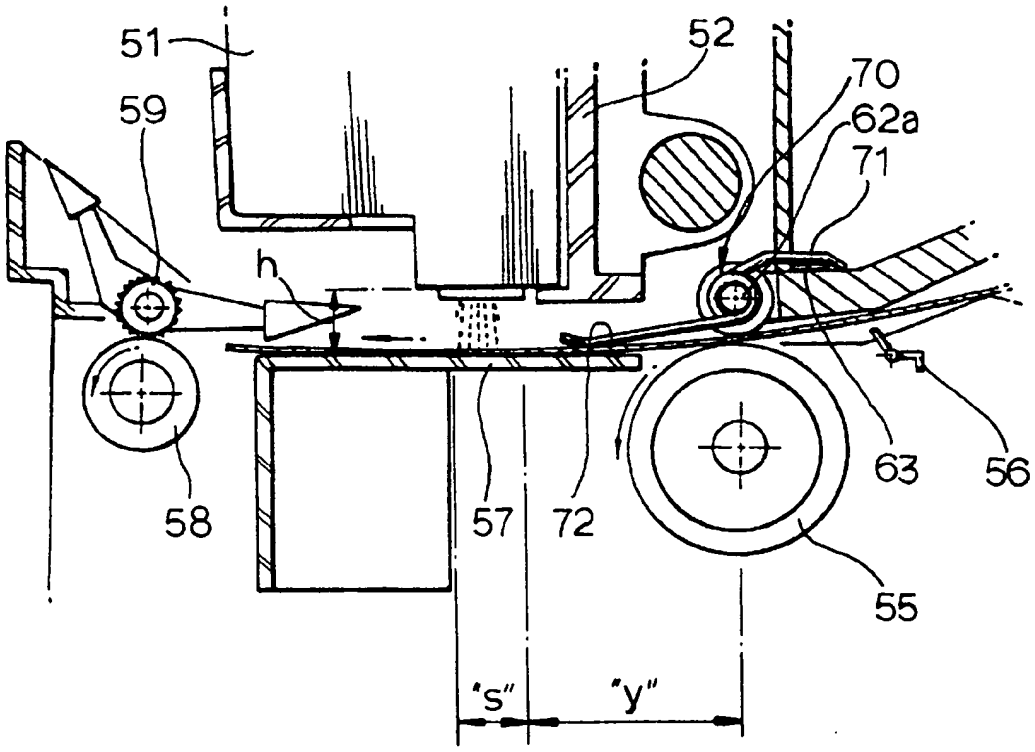


FIG. 5

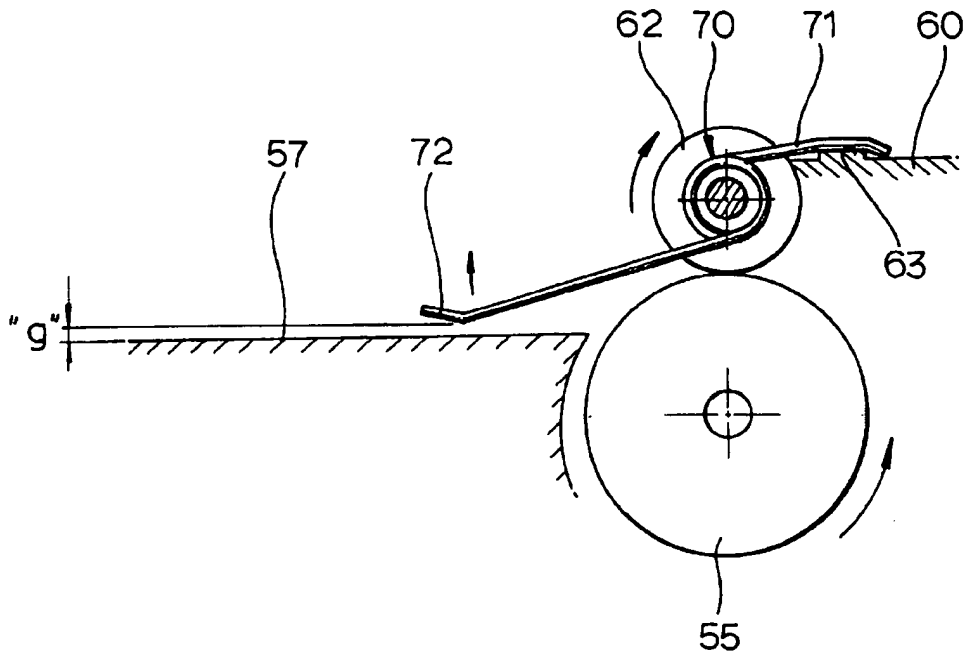
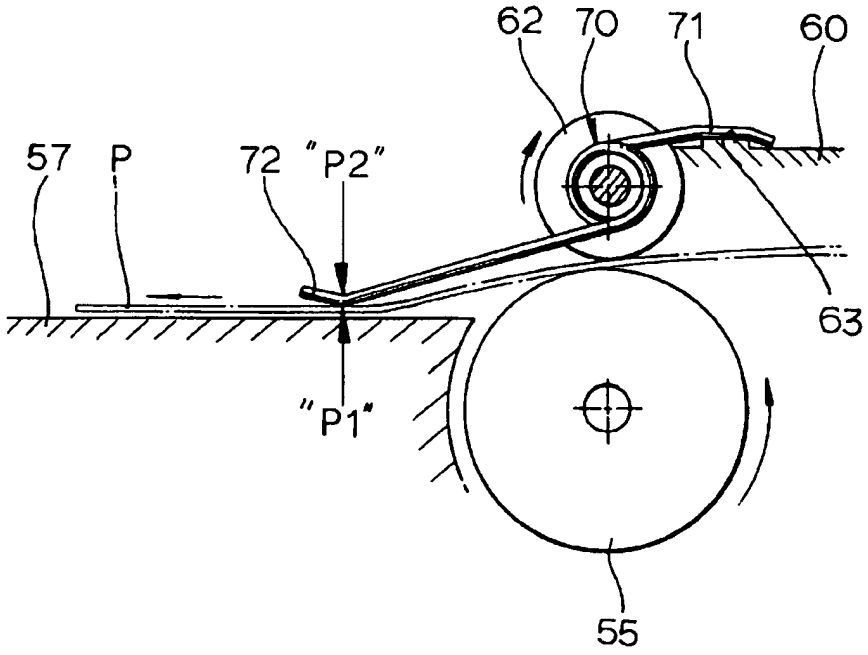


FIG. 6



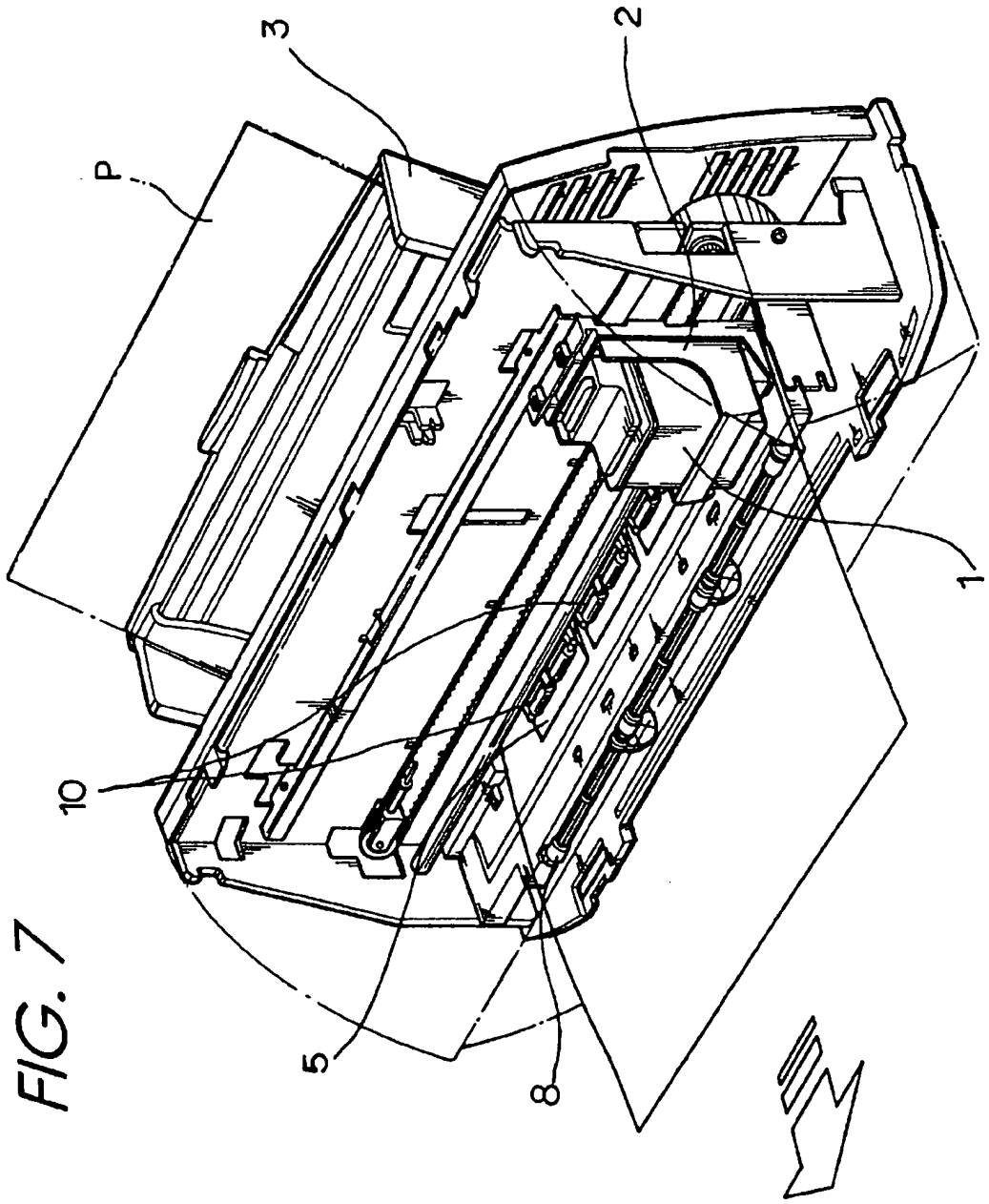


FIG. 7

FIG. 8

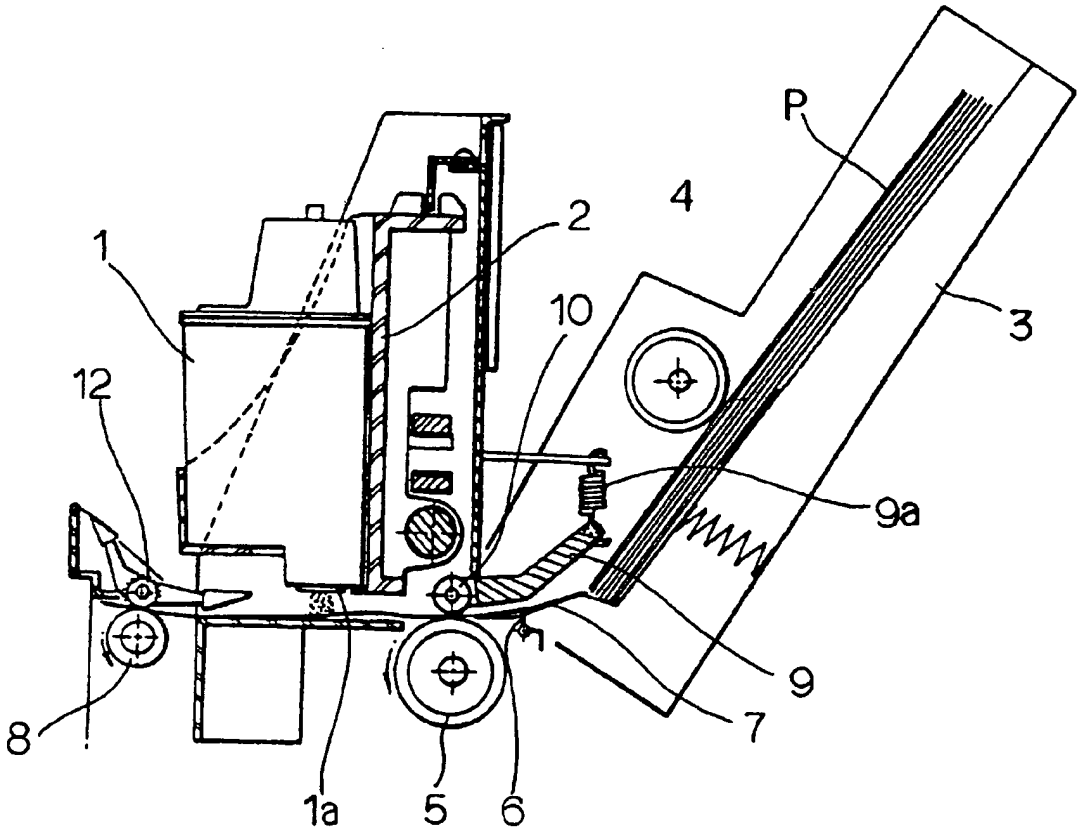


FIG. 9

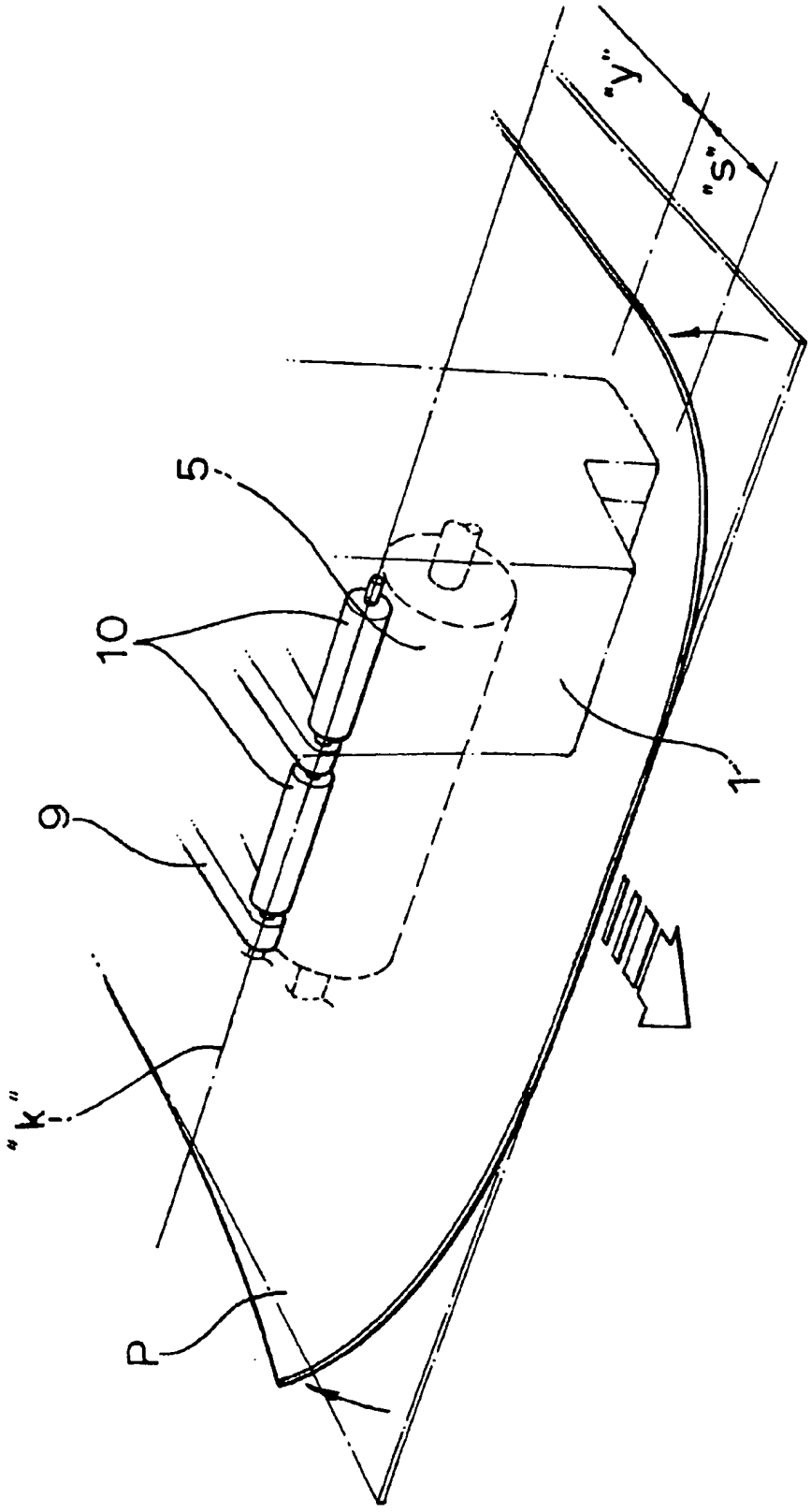
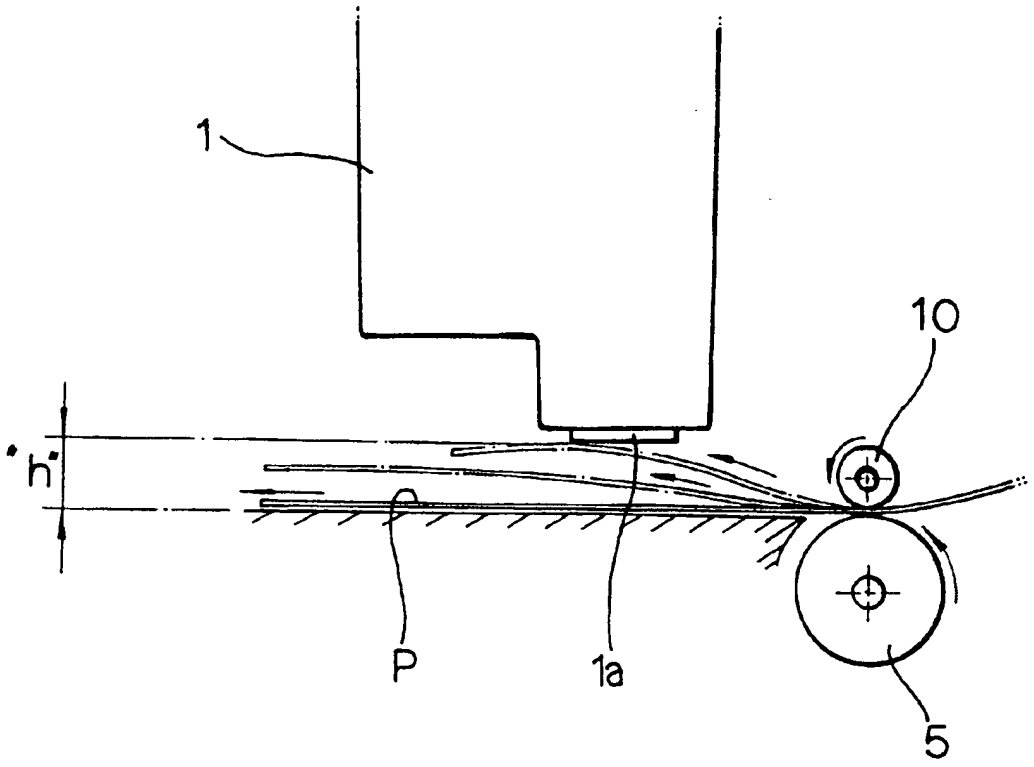


FIG. 10



PAPER FEEDING UNIT FOR APPARATUS USING PRINTER HEAD

CLAIM OF PRIORITY

This application makes reference to, incorporates the same herein, and claims all benefits accruing under 35 U.S.C. §119 from an application entitled Paper feeding Unit for Apparatus Using Ink-jet Printer Head earlier filed in the Korean Industrial Property Office on Aug. 30, 1996, and there duly assigned Ser. No. 96-37155 by that Office.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to printers. More particularly, the present invention relates to a paper feeding unit in a printer that reduces curling of the recording stock and maintains a gap between the printer head and the print media.

2. Discussion of Prior Art

Ink-jet printers, facsimiles, copy machines and like apparatuses employ printer heads. Referring to FIGS. **7–10**, many printers include a head cartridge **1** containing ink used to form characters on print media, a carriage **2** that moves the head cartridge **1** along the print area, and a driving unit (not illustrated). The printer also includes a paper cassette **3** holding paper P, pickup rollers **4** for picking up paper, a paper sensor (not illustrated), conveyance rollers **5**, aligning the leading edge of the paper and conveying it, and a registration sensor **6** controlling the conveyance rollers **5** and aligning the leading edge of the paper. A guide **7** conveys the paper, and a paper delivery roller **8** discharges the paper.

Once a print command is received by the printer from a host computer, the control unit of the printer directs the drive unit to operate. The pickup rollers **4** pick up the paper P one sheet at a time from the paper cassette **3** and deliver the sheets to the conveyance rollers **5** along the guide **7**.

The registration sensor **6** converts a distance to the entrance to the conveyance rollers into time, and adds paper to be conveyed according to a value obtained by the conversion to let the paper be curled between the pickup rollers **4** and the conveyance rollers **5**, aligning its leading edge. The conveyance rollers **5** deliver the paper to the printer front zone below a nozzle **1***a* of the cartridge **1**. The cartridge **1** on the carriage **2** is translated according to a signal produced from a head driver, depositing ink particles on the paper to form characters thereon. Once the one-line printing is completed, the conveyance rollers **5** transfer the paper by a given length to complete the overall printing job, and the paper is output through the paper delivery roller **8**, thus finishing one-cycle printing.

In the conventional ink-jet printer several problems may occur frequently when the paper P, picked up by the pickup rollers **4**, is conveyed to a printing zone S. Referring to FIG. **9**, a conveyance zone y exists between line k and the printing zone S. The paper, transferred by the conveyance force of the conveyance rollers **5**, passes through the conveyance zone y into the printing zone S where characters are formed on the paper P by the cartridge **1**. The characteristics of the paper P vary with the humidity and temperature of the room in which the printer is situated. The paper P must be used in a room with proper humidity and temperature to ensure good print quality. Improper temperature and humidity causes a paper curling problem in the conveyance zone y. The result of the paper curling problem is particularly acute after the paper moves into the printing zone y. In a room having improper temperature and humidity, the paper curls toward the printer or image-transferring head, which causes distorted images, smearing and other problems. Conventional printers typically do not have any mechanisms for preventing the paper curling problem. Therefore, printing sometimes is carried out on the paper having a portion elevated beyond a printing interval formed between the nozzle **1***a* of the cartridge **1** and a guide frame **11**. During printing, some areas of the paper P gets close to the nozzle **1***a* of the cartridge **1**, the interval between the paper P and the nozzle **1***a* being not constantly maintained, thus making the print quality inferior. In the worst case, the curled paper directly contacts the nozzle **1***a* of the cartridge **1** to make the nozzle **1***a* of the cartridge **1** unclean and deteriorating the overall print quality. In addition, the nozzle **1***a* of the cartridge **1** must be cleaned frequently. The paper curling problem also makes it difficult to introduce the leading edge of the paper between the paper delivery rollers **8**, thus resulting in a paper jam.

The above demonstrates a need for a mechanism that reduces the potential image transfer and paper feed problems associated with paper curl.

U.S. Pat. No. 5,564,847 for Media Handling in an Ink-jet Printer Having Guide Ribs issued to Patrick et al., and also U.S. Pat. No. 5,527,123 for Media Handling in an Ink-jet Printer issued to Jackson et al., include an upper print media guide **118** having an extending portion **119** that terminates in a lower support edge **122** which contacts and supports paper **110** from above. A lower print media guide **126**, downstream from the upper medium guide, includes an upwardly extending support edge **130**. Although the medium **110** is shown maintaining a uniform spacing between it and a printer head **103**, between the two dashed lines of FIG. **3**, the lower support edge **122** and the upper support edge **130** actually urge the medium **110** to assume a humped, or non uniform, print area relative to the head **103**.

U.S. Pat. No. 5,420,621 for Double Star Wheel for Post-printing Media Control in Inkjet Printing issued to Richtsmeier et al., referring to FIG. **1**, includes a main drive roller **15** with idler roller **16** cooperating to maintain tension in the sheet **12**. The device also includes a starwheel-type pinch wheel **28** which cooperates with an output driver roller **26** to maintain tension in the sheet and to control the position of the sheet relative to the printer head **22**.

SUMMARY OF THE INVENTION

The present invention is a paper feeding unit for an apparatus using an ink-jet printer head which includes a mechanism for maintaining paper so that it does not raise or curl toward the printer head or away from discharge rollers. The invention includes a plurality of springs installed on the friction rollers in close contact with the conveyance rollers. The springs, axially diverged, have ends which press the paper against the frame, proximate to the printing area, urging the paper to remain against the frame in an uncurled sate.

Accordingly, it is an object of the present invention to provide a paper feeding unit which prevents paper curling problems without modifying a conventional paper feeding mechanism.

Additional features and advantages of the invention will be set forth in the description which follows, and in part will be apparent from the description, or may be learned through practice of the invention.

BRIEF DESCRIPTION OF THE ATTACHED DRAWINGS

A more complete appreciation of the invention, and many of the attendant advantages thereof, will be readily apparent

as the same becomes better understood by reference to the following detailed description when considered in conjunction with the accompanying drawings in which like reference symbols indicate the same or similar components, wherein:

FIG. 1 is a vertical cross sectional detail view of the present invention installed in a paper feed mechanism;

FIG. 2 is a top right front perspective view of the present invention installed in a paper feed mechanism;

FIG. 3 is an enlarged partial right front exploded perspective view of the present invention installed in a paper feed mechanism;

FIG. 4 is a partial vertical cross sectional detail view of the present invention installed in a paper feed mechanism;

FIGS. 5 and 6 each are vertical schematic representations of the present invention installed in a paper feed mechanism;

FIG. 7 is a top right front perspective view of the interior of a conventional printer;

FIG. 8 is a vertical cross sectional detail view of a paper feeding unit;

FIG. 9 is a partial top right front perspective view of a typical paper feeding mechanism; and

FIG. 10 is a vertical schematic representation of a typical paper feeding mechanism.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

Referring to FIG. 1, paper P of a paper cassette **53** is delivered to conveyance rollers **55** by pickup rollers **54**. A registration sensor **56**, installed at the front end of the conveyance rollers **55**, is activated by the paper P. The conveyance rollers **55**, responsive to the registration sensor **56**, rotate in a reverse direction to align the leading edge of the paper P. Once the leading edge of the paper is aligned by the conveyance rollers **55**, the pickup rollers **54** stop and the conveyance rollers **55** rotate forwardly to deliver paper to a conveyance zone between the cartridge **51** and the conveyance rollers **55**.

Referring also to FIG. 2, a paper guide **60** is mounted over the conveyance rollers **55** and drawn away from the paper with a spring **61**. Friction rollers **62** on the front end of the paper guide **60** contact the top of the conveyance rollers **55**, rotating in synchronicity with the conveyance rollers **55**.

Referring also to FIG. 3, each of the friction rollers **62** includes roller shafts **62***a*. held by shaft bosses **61***a*. Coil springs **70** include a support end portion **71** contacting stopper **63** on the paper guide **60**, and a tension guide **72** that discourages the paper P from being raised.

A plurality of springs **70** each are mounted on the roller shafts **62***a*, spaced at given distances from each other. Each of the friction rollers **62** are urged against the conveyance roller **55** by the spring **61** cantilevering the paper guide **60** about pin **100**. The tension guides **72** of the springs **70** may be configured to closely contact the guide frame **57**.

In operation, once the electric motor goes into action, responsive to a command to print from a host computer, the pickup rollers **54** pick up the paper P from the paper cassette **53**, one by one, and route each sheet to the conveyance rollers **55**. When the paper P activates the registration sensor **56** at a predetermined point near the front end of the conveyance rollers **55**, the registration sensor **56** converts a distance from the registration sensor **56** to the entrance to the conveyance rollers **55** (where the conveyance rollers **55** contact the friction rollers **62**) and a distance forming a loop in a space between the paper guide **60** for alignment of the leading edge of the paper into the time.

The leading edge of the paper P moves into the point where the conveyance rollers **55** contact the friction rollers **62**, triggering the registration sensor **56**. The conveyance rollers **55** reverse rotation while the pickup rollers **54** are brought to a standstill, and the leading edge of the paper P is pushed toward the paper cassette **53**. The rear end of the paper P is caught by the pickup rollers **54**, and the middle part of the paper is bent upward within a space beneath the paper guide **60**, thus forming a temporary loop. When the middle part of the paper is spread out again, the aligned leading edge of the paper P contacts the conveyance rollers **55** and friction rollers **62**.

Referring to FIG. **4**, as soon as the paper alignment process is completed, the conveyance rollers **55** begin to rotate forwardly and, simultaneously, the pickup rollers **54** also rotate forwardly, advancing the paper into the conveyance zone y. The pickup rollers **54** stop rotating as soon as the paper completely passes through the pickup rollers **54**, and the conveyance rollers **55** advance the paper P into the conveyance zone y.

Referring now to FIGS. **4–6**, the paper P is conveyed as the conveyance rollers **55** rotate counterclockwise, and the friction rollers **62** rotate clockwise. The rotating force of the friction rollers **62** is transmitted to the torsion spring **70** so that a gap "g" is created between the tension guide **72** and the frame **57**.

The size of the gap "g" depends on the thickness of paper P used. If the thickness of the paper is larger than the gap "g," or the strength of the spring is so large that the paper P is bent, a force P1 for moving the tension guide **72** of the spring **70** upward, is generated. A repelling force P2 is created by the torsion spring **70**, compressing the paper P into the given scope of the gap "g" prior to entering the printing zone S. This configuration assures a constant printing interval h. This configuration predisposes the paper to remain substantially flat, and eventually reliably fed between the delivery roll **58** and friction wheel **59**, precluding paper jams.

As described above, the inventive means of keeping paper from being raised, prevents paper curling, image blurring or paper jam problems throughout the cycle of paper through a printer. The front end of the tension guide **72** of the torsion spring **70** does not interfere with the printing zone S.

According to the present invention, the printer head is designed to be spaced a given distance away from the print media, to assure unblurred images. The present invention precludes image blurring and paper jam problems, as well as the difficulties associated with introducing paper into paper delivery rollers often caused by interference of light or bent print media with the printer head. In addition, the slim tension guides of the present coil springs keep the paper from being raised, enhancing the space utilization of the apparatus.

It will be apparent to those skilled in the art that various modifications and variations may be made in the inventive paper feeding unit without departing from the spirit or scope of the invention as claimed.

What is claimed is:

1. An apparatus for reducing curl of a recording medium, comprising:

a frame providing a path of conveyance for a printable recording medium during formation of images on the medium;

a paper guide pivotally mounted on said frame with a leading end of said paper guide defining an orifice

accommodating entry of a leading edge of the medium as the medium travels along said path, said paper guide rotating by an amount accommodating passage of media guided along said path;

a conveyance roller positioned along said path;

a second roller mounted on a trailing end of said guide to form a nip with said conveyance roller;

a spring mounted on said guide in coaxial rotational engagement with one end of said second roller, said spring having a first end extending radially outwardly from said one end to engage said frame within said path, and a second end engaging said guide while said first end engages said frame;

said rotational engagement forcing a separation between said first end and the frame defining a gap that receives the leading edge during rotation of said second roller; and

said first end restraining displacement of the medium from said frame prior to said formation of images.

2. The apparatus as recited in claim **1**, further comprising a resilient member biasing a second end of said paper guide to maintain said first end of said spring with said frame.

3. The apparatus as recited in claim **1**, further comprising a resilient member biasing said second roller to maintain engagement with said conveyance roller along said nip.

4. The apparatus as recited in claim **1**, further comprised of said spring having a coiled section intermediate said first end and said second end, said coiled section biasing said first end of said spring toward said frame.

5. An apparatus for reducing curl of a recording medium, comprising:

a frame providing a path of conveyance for a printable medium during formation of images on the medium;

a guide pivotally mounted on said frame with a leading end positioned along said path to form an orifice accommodating entry of a leading edge of the medium;

a conveyance roller positioned along said path in an operational relation with a trailing end of said guide;

an elongate member disposed on said trailing end of said guide in a rotationally responsive relation to said conveyance roller, said elongate member having a first end extending longitudinally outwardly from said trailing end into said path to engage said frame, and a second end biased against said rotationally responsive relation to urge engagement of said first end against said guide;

said elongate member responding to rotation of said conveyance roller while in said rotationally responsive relation by rotating away from said frame and against said urge while controlling a distance of separation between the medium travelling along said path and an image-transferring head oriented to form said images upon the medium within an image-transferring zone of said path while restraining movement of the medium away from said frame within said image-transferring zone.

6. The apparatus as recited in claim **5**, further comprised of a spring biasing said guide relative to the image-transferring head.

7. The apparatus as recited in claim **5**, further comprised of a second roller being mounted on said trailing end of said guide to form a nip with said conveyance roller.

8. The apparatus as recited in claim **5**, further comprised of:

a roller rotatable mounted on said guide in rotational engagement with said elongate member; and

a spring biasing said guide relative to the image-transferring head.

9. The apparatus as recited in claim **6**, further comprised of a roller frictionally engaging said conveyance roller while maintaining rotational engagement with said elongate member.

10. The apparatus as recited in claim **9**, further comprised of a spring biasing said guide relative to the image-transferring head.

11. A paper feeding unit for an apparatus using an ink-jet printer head, comprising:

conveyance rollers furnishing a conveyance force to paper held in a paper cassette;

friction rollers installed over each of the conveyance rollers, corresponding to it for giving a pressure force to the paper, thus making the paper be conveyed;

a paper guide having the friction rollers rotatably installed, and its rear end receiving an elasticity from tension springs so as to make the friction rollers come in close contact with the conveyance rollers; and

means of keeping the paper from being raised, provided to roller shafts of the respective friction rollers, and pressing the paper, conveyed by the conveyance rollers and the friction rollers, not to be raised.

12. A paper feeding unit according to claim **11**, wherein said means are torsion coil springs each provided to the roller shafts of the friction rollers for moving the paper, corresponding to the conveyance rollers.

13. A paper feeding unit according to claim **12**, wherein each of the torsion coil springs includes a support end portion, held by the paper guide, and a tension guide formed opposite to the support end portion for keeping the paper from being raised.

14. A paper feeding unit according to claim **13**, wherein a gap, a space used for paper conveyance, is created between the tension guide and a base frame through which the paper passes during the paper conveyance of the conveyance rollers and friction rollers.

15. A paper unit according to claim **13**, wherein the front end of the tension guide of the torsion coil spring does not exceed the printing zone.

16. A paper feeding unit for an apparatus using ink-jet printer head, comprising:

conveyance rollers for furnishing a conveyance force to paper held in a paper cassette;

friction rollers installed over each of the conveyance rollers, corresponding to it for giving a pressure force to the paper, thus making the paper be conveyed;

a paper guide having the friction rollers rotatably installed, and its rear end receiving an elasticity from tension springs so as to make the friction rollers come in close contact with the conveyance rollers; and

torsion coil springs with a tension guide and a paper guide, provided to roller shafts of the respective friction rollers, and pressing the paper, conveyed by the conveyance rollers and the friction rollers, not to be raised.

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accommodating entry of a leading edge of the medium as the medium travels along said path, said paper guide rotating by an amount accommodating passage of media guided along said path;

a conveyance roller positioned along said path;

a second roller mounted on a trailing end of said guide to form a nip with said conveyance roller;

a spring mounted on said guide in coaxial rotational engagement with one end of said second roller, said spring having a first end extending radially outwardly from said one end to engage said frame within said path, and a second end engaging said guide while said first end engages said frame;

said rotational engagement forcing a separation between said first end and the frame defining a gap that receives the leading edge during rotation of said second roller; and

said first end restraining displacement of the medium from said frame prior to said formation of images.

2. The apparatus as recited in claim 1, further comprising a resilient member biasing a second end of said paper guide to maintain said first end of said spring with said frame.

3. The apparatus as recited in claim 1, further comprising a resilient member biasing said second roller to maintain engagement with said conveyance roller along said nip.

4. The apparatus as recited in claim 1, further comprised of said spring having a coiled section intermediate said first end and said second end, said coiled section biasing said first end of said spring toward said frame.

5. An apparatus for reducing curl of a recording medium, comprising:

a frame providing a path of conveyance for a printable medium during formation of images on the medium;

a guide pivotally mounted on said frame with a leading end positioned along said path to form an orifice accommodating entry of a leading edge of the medium;

a conveyance roller positioned along said path in an operational relation with a trailing end of said guide;

an elongate member disposed on said trailing end of said guide in a rotationally responsive relation to said conveyance roller, said elongate member having a first end extending longitudinally outwardly from said trailing end into said path to engage said frame, and a second end biased against said rotationally responsive relation to urge engagement of said first end against said guide;

said elongate member responding to rotation of said conveyance roller while in said rotationally responsive relation by rotating away from said frame and against said urge while controlling a distance of separation between the medium travelling along said path and an image-transferring head oriented to form said images upon the medium within an image-transferring zone of said path while restraining movement of the medium away from said frame within said image-transferring zone.

6. The apparatus as recited in claim 5, further comprised of a spring biasing said guide relative to the image-transferring head.

7. The apparatus as recited in claim 5, further comprised of a second roller being mounted on said trailing end of said guide to form a nip with said conveyance roller.

8. The apparatus as recited in claim 5, further comprised of:

a roller rotatable mounted on said guide in rotational engagement with said elongate member; and

a spring biasing said guide relative to the image-transferring head.

9. The apparatus as recited in claim 6, further comprised of a roller frictionally engaging said conveyance roller while maintaining rotational engagement with said elongate member.

10. The apparatus as recited in claim 9, further comprised of a spring biasing said guide relative to the image-transferring head.

11. A paper feeding unit for an apparatus using an ink-jet printer head, comprising:

conveyance rollers furnishing a conveyance force to paper held in a paper cassette;

friction rollers installed over each of the conveyance rollers, corresponding to it for giving a pressure force to the paper, thus making the paper be conveyed;

a paper guide having the friction rollers rotatably installed, and its rear end receiving an elasticity from tension springs so as to make the friction rollers come in close contact with the conveyance rollers; and

means of keeping the paper from being raised, provided to roller shafts of the respective friction rollers, and pressing the paper, conveyed by the conveyance rollers and the friction rollers, not to be raised.

12. A paper feeding unit according to claim 11, wherein said means are torsion coil springs each provided to the roller shafts of the friction rollers for moving the paper, corresponding to the conveyance rollers.

13. A paper feeding unit according to claim 12, wherein each of the torsion coil springs includes a support end portion, held by the paper guide, and a tension guide formed opposite to the support end portion for keeping the paper from being raised.

14. A paper feeding unit according to claim 13, wherein a gap, a space used for paper conveyance, is created between the tension guide and a base frame through which the paper passes during the paper conveyance of the conveyance rollers and friction rollers.

15. A paper unit according to claim 13, wherein the front end of the tension guide of the torsion coil spring does not exceed the printing zone.

16. A paper feeding unit for an apparatus using ink-jet printer head, comprising:

conveyance rollers for furnishing a conveyance force to paper held in a paper cassette;

friction rollers installed over each of the conveyance rollers, corresponding to it for giving a pressure force to the paper, thus making the paper be conveyed;

a paper guide having the friction rollers rotatably installed, and its rear end receiving an elasticity from tension springs so as to make the friction rollers come in close contact with the conveyance rollers; and

torsion coil springs with a tension guide and a paper guide, provided to roller shafts of the respective friction rollers, and pressing the paper, conveyed by the conveyance rollers and the friction rollers, not to be raised.

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	Type	L #	Hits	Search Text	DBs	Time Stamp	Comments	Error Definition
1	IS&R	L1	224	("400/638").CCLS.	USPAT	2001/02/26 09:44		
2	IS&R	L2	144	("400/645").CCLS.	USPAT	2001/02/26 09:52		
3	BRS	L4	9	400/645 and (align same roller$)	USPAT	2001/02/26 09:54		Truncation Overflow. Return string from Server is: 5`236`357
4	BRS	L5	169	400/$.ccls. and (align same roller$)	USPAT	2001/02/26 10:13		Truncation Overflow. Return string from Server is: 5`0`0`400
5	BRS	L8	139	400/$.ccls. and (align same roller$ and shaft)	USPAT	2001/02/26 10:15		Truncation Overflow. Return string from Server is: 5`0`0`400